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AUTHOR Gotanda, Masae; And Others
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ABSTRACT

An online circulation system--ULISYS (the Universal Library System Ltd.) manufactured by Digital Equipment Corporation (DEC)--is being installed in the Hawaii State Library, Kaneohe Regional Library, Kailua Community Library and Waimanalo Community/School Library. These libraries are the first users of a statewide online circulation system intended to eventually serve all of Hawaii's public and community/school libraries. The circulation project is a part of a larger automation project which has already installed automated acquisitions and cataloging modules--BIBLIOS (the Book Inventory Building and Library Oriented System) HAWAII--in Hawaii's Centralized Processing Center, which processes books for the state's school and public libraries. Other statewide areas of library operations are also intended for automation by Hawaii's Office of Library Services. This report describes in detail the automated circulation project. Following a statement of the problem are discussions of project objectives, methodology, and status; installation requirements; and evaluation criteria. Also briefly described are the acquisitions and cataloging automation projects and the planned projects for automating (1) serials control; (2) the acquisition, storage, and distribution of Hawaiiana; (3) the processing of non-book material; and (4) a management information system. A separate appendix reproduces DEC equipment descriptions and specifications and DEC price data. (ESR)

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HAWAII
DEPARTMENT OF EDUCATION
OFFICE OF LIBRARY SERVICES

PUBLIC LIBRARY AUTOMATION REPORT: CIRCULATION

July, 1982

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PREFACE

The Office of Library Services begins the implementation of the statewide, online circulation system in 1982. The Hawaii State Legislature funded $702,194 to install the system in the Hawaii State Library, Kaneohe Regional Library, Kailua Community Library and the Waimanalo Community/School Library. Representing one each of the types of libraries available in the system, these libraries will serve as first users of the circulation module for the State.

The Office of Library Services is grateful for the advice and technical expertise supplied by the Department of Budget and Finance, Electronic Data Processing Division. Applications Manager Mits Hiraoka has spent considerable time and effort on the circulation system since it was first brought to his attention several years ago. Recently, Carl Tokunaga, Facilities Analyst, gave technical aid in the planning for the computer site. Thanks also to Raleigh Awaya, Director, Management Systems Office, University of Hawaii. The public libraries also wish to thank the Board of Education, the Legislature and the State departments for making this huge project possible for the public libraries. Finally, the Office of Library Services notes with gratitude the many vendors, consultants, and librarians who supplied information, demonstrations and workshops on circulation systems.

This report was written by Masae Gotanda, Head, Research and Evaluation Services, with assistance from Takashi Akimoto, Director, Centralized Processing Center, and Bob Gibbons of the Research and Evaluation Services staff.

Bart Kane

Bart Kane
State Librarian

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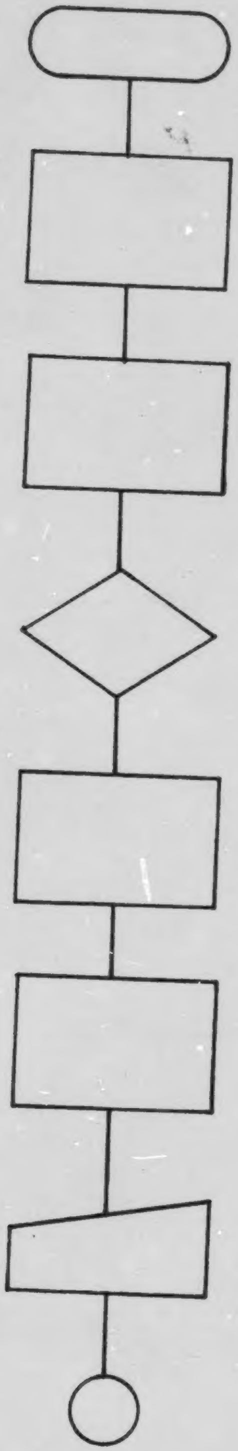


SUMMARY

I. SUMMARY

Background

The Department of Education, Office of Library Services, reviewed its programs and services during the recision years of 1973-75 and decided to automate its major operations in order to utilize the available resources to improve library services for the people of Hawaii.

A feasibility study conducted in 1973 by a consultant firm, Data Technical Analysts, Inc., Honolulu, identified the following candidate areas for automation:

1. Acquisitions
2. Catalog
3. Serials
4. Circulation
5. Hawaiiana
6. Non-book materials

In subsequent years, the Office of Library Services added a seventh category: Management information.

Methodology

The task of automating the libraries in the Department of Education was organized on a project basis in 1974. The team included a project manager, positions for an analyst, a programmer and a team of four librarians available to aid in the installation of the automated system.

In subsequent years, through reorganization, the library professional assigned this task was reduced to less than one, the project manager's duties included all of the research, evaluation, management of federal funds, and other development work for the Office of Library Services. The Department of Education's Data Processing Systems Office took over the technical positions: a temporary federally funded programmer, a temporary federally funded analyst, and a permanent, state funded analyst. In September 1981, the federally funded positions were returned to the Office of Library Services.

Plans for the purchase and installation of an automated circulation system began 1980. Since then, the Office of Library Services has (1) requested and has been granted permission by the Governor's EDP Advisory Committee to automate the library circulation system; (2) been granted $702,194 by the 1982 Hawaii State Legislature to purchase a computer, programs, and to install the system in four libraries: Hawaii State Library, Kaneohe Regional Library, Kailua Community Library, and Waimanalo Community/School Library. The Office of Library Services intends to expand the system statewide to include all of the public and community/school libraries. The Governor signed the supplemental appropriations bill June 17, 1982.

Constraints

The project has suffered in recent years for financial, personnel and administrative support. Librarians are looking forward to the implementation of the circulation module which will enable them to provide better services to the general public. The project will need staffing to successfully install circulation for this large system.

Any project suffers from the long periods of time needed for contractual services. Schedules are based on optimal conditions. Therefore, should contract negotiations take longer than expected, the project installation will be delayed.

Status

The acquisitions and catalog modules have been implemented through the purchase, modification and installation of an automated system: BIBLIOS (BOOK INVENTORY BUILDING AND LIBRARY ORIENTED SYSTEM) HAWAII. The Office of Library Services is currently engaged in negotiations for the purchase and installation of an online circulation system, ULISYS (UNIVERSAL LIBRARY SYSTEM LTD.).

Plans for the Future

In the immediate future, the Office of Library Services will purchase, modify and install an online circulation system.

The Library System will also:

1. Research and install an online catalog system.
2. Research, purchase, modify and install a management information system to control budgeting, accounting and basic personnel routines.
3. Use the catalog-acquisitions cycles for indexing Hawaiiana.
4. Convert to an online acquisitions system.

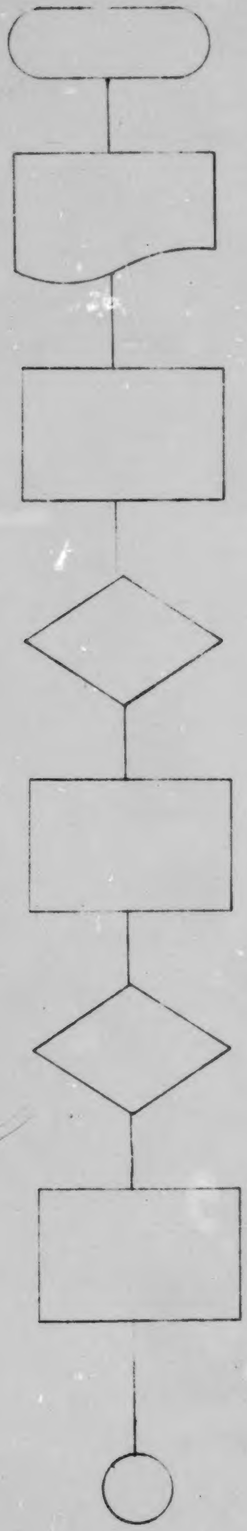
5. Convert the present datatel communications systems to a message system available in ULISYS. This would expand the communications system from the present University of Hawaii, Hawaii Regional Library, Maui Regional Library, Kauai Regional Library and the Hawaii State Library, to include every public library with a circulation terminal.

6. Study the possibility of sharing the circulation and other resources with the State operated community colleges.

Figs. 1-2 show the locations of libraries in the system that need to be automated. Tables Ia-e describe the size of the system. Fig. 3 shows the status of automation and future plans.

Evaluation

The automation of the major operations of the Office of Library Services is an enormous task. The Library System has succeeded in installing and operating acquisitions and catalog systems for the nations largest book processing plant, the Centralized Processing Center, and for one of the country's most complex school and public library systems.



ACQUISITIONS

II. ACQUISITION

Statement of the Problem

In the cycle of library materials administration, acquisitions, including the inventory of materials purchased, is the logical initial phase followed by cataloging, circulation and finally withdrawal from the collection. In 1975, the primary focus of attention was the book order and catalog modules for 229 school libraries and 46 public libraries. The Centralized Processing Center, assigned to control the book acquisitions and catalog procedures, was burdened with manual procedures that took huge amounts of time to complete and inadequate manpower to handle the enormous tasks. This in turn impacted on the ability of the library service units to deliver materials to students and public.

In an effort to alleviate the problems experienced by the large book processing agency, the Office of Library Services explored data processing methods and programs available to handle massive, repetitive tasks necessary to the operation of an efficient book acquisition and catalog systems. Constrained by time and the lack of trained, technical personnel, the Office of Library Services elected to forego an extensive research and development program and decided to search for an operating system to be purchased, modified and installed for use by the Centralized Processing Center.

Objectives

The objectives of research for a book acquisitions system were:

1. Improvement of school and public library services through the control and increase in the flow of materials from the Centralized Processing Center.

2. Management control through the ability to handle budgeting and accounting necessary for the 229 school and 47 public library order units.

3. Staff savings in processing.

4. Administrative control of the inventory of the school and public libraries.

5. The creation of machine readable inventory and catalog or bibliographic data files to be used in the future to provide an automated circulation system.

Methodology

The Office of Library Services researched, purchased, modified and installed an acquisitions catalog system BIBLIOS, purchased from the Orange County Library System, Orange, Calif. Rebuilt and renamed BIBLIOS HAWAII, the system has been operating since November 1976 on the State's computer managed by the Department of Budget and Finance, Electronic Data Processing Division. A batch-mode system, BIBLIOS HAWAII is described in the following pages and in Figs. 4-6

BIBLIOS HAWAII is divided into nine subsystems and into sixteen cycles:

SUBSYSTEM NAME	CYCLE NAME
BIBLIOGRAPHIC	Bibliographic
CATALOG	COM Materials Catalog
PROCUREMENT	Pre-Order Order Budget Vendor Invoice Receipts/Cancellations
INVENTORY	Inventory
LOCATOR GUIDE	Locator Guide
SPECIAL REPORTS	Special Reports (Collection Profile)
PROJECTED BRANCH	Projected Branch
SPECIAL SUBSYSTEMS	Periodical Select Keys Media Catalog
LITERAL TABLE	Literal Table

Detailed descriptions of BIBLIOS HAWAII subsystems follow.

BIBLIOGRAPHIC SUBSYSTEM

The Bibliographic Subsystem creates and maintains a permanent data base of bibliographic information: the Title Master File. This file serves as a basis for cataloging, inventory, procurement and statistical activities within the library. Programs within this subsystem perform the following functions:

1. Create and process into the Title Master File bibliographic data on new library materials from manually prepared sources.

2. Modify or delete entries in the Title Master File.

3. Generate listings which display the contents of the Title Master File in various formats.

Reports produced by the Bibliographic Subsystem are:

1. Master Title List.
2. Master Title Supplement.
3. Master Title Changes.
4. Available List.
5. Master Author Index.
6. Master Title Index.
7. Bibliographic Cycle Input/Error List.
8. Title Master File Edit Index.
9. Bibliographic Cycle Balance Totals.

CATALOG SUBSYSTEM

This subsystem processes only print materials (books). It prepares and arranges in sequence for catalog listing a tape for the COM (Computer-Output-Microfilm) vendor to process into microfilm catalogs. The subsystem is capable of generating full or cumulative supplement catalogs.

Reports produced by this subsystem are:

1. Balance/Error List.
2. Author/Title List-Adult.
3. Author/Title List-Juvenile.
4. Subject List-Adult.
5. Subject List-Juvenile.

The Author/Title Lists and Subject Lists are translated into catalogs for public use.

PROCUREMENT SUBSYSTEM

The Procurement Subsystem performs functions concerned with the purchasing of library materials. The subsystem accumulates book orders, generates ordering documents and receiving documents, and processes receipts.

Pre-Order Cycle

The Pre-Order Cycle captures bibliographic, vendor and cost center data requirements for books and other library materials and produces reports associated with the process of placing orders.

Programs within this cycle accumulate orders from school and public libraries, select from the vendor file appropriate vendors, receive bibliographic data, and generate pre-order lists.

Reports produced by the Pre-Order Cycle are:

1. Review List.
2. Pre-Vend List.
3. Pre-Order List.
4. Error List.
5. Input/Error List.

Order Cycle

The Order Cycle requires no manual preparation of source documents. The Cycle receives data from the Pre-Order Cycle, assigns sub-purchase order numbers, updates the vendor file, updates the budget files and generates documents on the status of book orders.

Reports produced by the Order Cycle are:

1. Sub-Purchase Orders.
2. Requisition Data List.
3. Receiving and Distribution List.
4. Cumulative On-Order List.
5. Branch On-Order List.
6. Vendor Appropriations List.

Budget Cycle

This cycle keeps the Budget History File in continual update and generates financial reports for all ordering libraries combined. Budget data is recycled to zero to start each fiscal year. Any encumbrances are added to the next fiscal year's appropriation for each category.

Reports generated by the Budget Cycle are:

1. Budget Detail Report.
2. Budget Regional Report.
3. Budget Summary Report.
4. Budget Input/Error List.
5. Budget History Change List.

Vendor Cycle

This cycle is used to keep an updated file of vendors used by the system and to prepare a statistical report of the performance of these book jobbers.

Reports produced by the Vendor Cycle are:

1. Vendor Performance.
2. Vendor Input/Error List.
3. Vendor File.

Invoice Cycle

This cycle maintains accurate vendor and budget performance data. It processes receipts and cancellation data and purges all fully paid sub-purchase orders. It also captures the number of copies received and the actual prices paid, and revises list prices.

Reports produced by the Invoice Cycle are:

1. Invoice Suspense List.
2. Invoice Input/Error List.

Receipts/Cancellations Cycle

The Receipts/Cancellations Cycle processes receipts and cancellations against entries outstanding on the Order File. It produces reports reflecting the current status of orders outstanding in the system.

Reports generated by this cycle are:

1. Branch Receipts/Cancellations List.
2. Headquarters Receipt List.
3. Cancellation Notices.
4. Pending Cancellation List.
5. Receipt Input/Error List.
6. Headquarters Cancellation List.

INVENTORY SUBSYSTEM

This subsystem creates an Inventory Master File and provides for processing new information into this file. A record of the total number of copies of all items in all media is contained in the Inventory Master File.

Reports produced by this subsystem are:

1. Inventory Master List.
2. Inventory Supplement.
3. Inventory Change List.
4. Convelope (Special Forms).

LOCATOR GUIDE SUBSYSTEM

The Locator Guide Subsystem creates a formatted and sequenced file of book identification numbers and a list of libraries that have the titles. The file is now designed to be sent to a COM vendor for a microfilm catalog.

The report produced by this subsystem is:

1. Locator Guide.

SPECIAL REPORTS SUBSYSTEM

This subsystem uses data from the Short Title File, containing bibliographic data, and the Inventory Master File to accumulate holdings statistics for selected or all libraries and to generate bar charts of the results. The intent is to produce in graphic form a profile of branch library holdings for selected media, binding, level, sublevel, and a range of publication dates. For each profile a further subdivision of Dewey numbers or Cutter Codes can be selected. This will generate a bar graph for each range of call numbers specified.

Reports generated by this subsystem are:

1. Profile Error List.
2. Collection Profile.

PROJECTED BRANCH SUBSYSTEM

The purpose of the Projected Branch Subsystem is to provide for library materials collection and to create a new branch without disturbing the ongoing Pre-Order process for existing branches and without setting up computer conditions for a follow through of the ongoing Order Cycle.

Reports produces by this subsystem are:

1. Projected Branch Review List.
2. Projected Branch Pre-Vend List.
3. Projected Branch Pre-Order Cost Report.
4. Projected Branch Error List.
5. Projected Branch Input Errata List.

SPECIAL SUBSYSTEMS

The cycle within this subsystem are new and have been added by Orange County and the Hawaii State Library System recently but are not totally implemented. These are the:

Periodical Subsystem

The Periodical Subsystem creates and maintains a permanent data base of periodical (magazine) information called the Periodical Master File. The subsystem processes transactions which add, change, and delete entries from the Periodical Master File.

Reports produced by this subsystem are:

1. Periodical Transaction Listing.
2. Periodical Master Listing.
3. Periodical Master Update List.

Select Keys Cycle

The purpose of this cycle is to extract entries from the full Title Master File by selected keys (Office of Library Services identification number) and/or by selected media codes.

Non-book Catalog Subsystem

A by-product of the Catalog Subsystem, this cycle processes media codes other than books (01) such as phonodiscs, phonotapes, films, etc. The cycle arranges and prepares in sequence adult and juvenile materials separately to produce a tape for the COM vendor to process into a catalog.

Reports produced by this Nonbook Catalog Subsystem are:

1. Balance/Error List.
2. Author/Title List - Adult.
3. Subject List - Adult.
4. Author/Title List - Juvenile.
5. Subject List - Juvenile.

LITERAL TABLE SUBSYSTEM

The Literal Table Subsystem generates a file of commonly used codes and their related literal names to be commonly used throughout the system for verification and translation purposes. The report produced by this subsystem is:

1. Literal Table.

Accomplishments

Installed and operating since November 1976, BIBLIOS HAWAII has met the objectives originally set for an automated acquisitions system:

1. It brought under control the flow of library materials and increased the quality and quantity of books going to school and public libraries.

   Statistics show in 1974 the Centralized Processing Center handled 17,600 titles and 292,829 volumes; in 1981 the Center processed 40,000 titles and 410,000 volumes. Automation has more than doubled the Center's ability to process titles and to add copies.

   Data processing has also shortened the book order time. Before automation, the Center took an average of six months to hand sort order slips. With data processing techniques, this time has been reduced to two weeks for data entry and several days to machine process purchase orders and to print order lists.

2. It has made it possible to handle large sums of money for over 300 order units.

   In 1974, the Centralized Processing Center handled $949,000 in school and public library book funds. In 1981, it managed 2.2 million in school library, public library, and curriculum materials funds.

3. It has created staff savings to the extent that the Centralized Processing Center has not doubled its staff while increasing its workload more than 100 percent.

   In 1975, the Center had 41 employees on its payroll; in 1981 this figure had increased to 42.5.

4. It has provided machine readable inventory control for school and public libraries.

   BIBLIOS HAWAII has in its inventory all of the books purchased for school and public libraries since it began operation. This inventory can be used by the libraries in developing collections and in the building of automated catalog and circulation systems.

5. It has created order, inventory, catalog files to be used presently in the microfilm catalog and in the future for a circulation system.

   BIBLIOS HAWAII has built an inventory and catalog system title tags and bibliographic information crucial to the conversion to an online acquisitions and catalog systems.

BIBLIOS HAWAII managed to bring under control the operating procedures for the nations largest single book processing center, paved the way for future development in the automation of libraries, and provided opportunities for services from both school and public libraries.

Evaluation

BIBLIOS HAWAII has been constantly enhanced, modified and used in order to give the best possible service to the participating libraries. It is a batch system, completing an operating cycle every two weeks.

Changes in the book industry will affect the ability of BIBLIOS HAWAII to control acquisitions procedures. As publishers issue smaller quantities of materials, libraries and bookstores will develop more efficient methods to compete for the limited amounts of information available.

The Office of Library Services has already noted the beginning of obsolescence for this type of acquisitions system. After the installation of the online circulation and catalog modules, the Library System will direct its attention to the research and installation of an online acquisitions system. When this is done, BIBLIOS HAWAII will have served its purpose.

CATALOG

III. CATALOG

Statement of the Problem

The automation of the acquisitions cycle resulted in massive quantities of materials flowing into libraries. In the public libraries, these materials needed to be cataloged and made available as quickly as possible to readers. The traditional card catalog provided information on books held by individual libraries thereby limiting the use of each library to its local and immediate, primary users. The Library System therefore needed to disperse its bibliographic file of materials available to as wide as audience as possible so that books could be shared by all library users in the State. Further, it was imperative that this task be done as economically as possible.

Objectives

The objectives of the catalog module were:

1. The creation of a single bibliographic data file of all of the titles in the system so that these books could be made available to all library users in the State.

2. The addition of titles on order in this same file so that library patrons could reserve these books as soon as the items were received by the public service units.

3. The management of the bibliographic file to create staff savings in the public service units that could be translated into personnel time available for direct service to users.

4. The structuring of the machine readable bibliographic file so that it could be used for an online public access catalog module.

Methodology

The original programs for BIBLIOS purchased from Orange County Library System culminated in a printed book catalog. Realizing that the Office of Library Services could not undertake the quarterly cost of printing and distributing such a massive catalog, the automation project elected to research and develop new methods for consolidating and distributing bibliographic information.

The Office of Library Services faced two massive tasks:

1. The conversion into machine readable form all of the catalog files for books bought and held by the system.
2. The management of the machine readable files into a union catalog of public library titles.

Lacking equipment, personnel and local expertise, the Office of Library Services contracted with Blackwell North America, Beaverton, Oregon, to convert 78 percent of the titles held by the Hawaii State Library into machine readable form. The librarians in the State Library then examined the remaining 22 percent and sent bibliographic data for the books they wished to keep to the Centralized Processing Center for conversion to machine readable form. This process converted approximately 95 percent of the titles in the system. The remaining 5 percent is scattered in the branch system and will be caught and converted during the circulation cycle.

The Office of Library Services found local equipment and expertise lacking for the development of a machine readable catalog and turned to Autographics, Inc., Monterey, California, for the development of a catalog using computer-output-microfilm (COM) techniques. One of the first COM catalogs to be developed nationally, Hawaii soon discovered that this technique would spread quickly to other libraries with machine readable data bases.

As the COM catalog rose in popularity, Hawaii began to experience contractual and delivery problems. The Office of Library Services therefore undertook development a second time and programmed its own catalog using the State's computer to "explode" the master bibliographic file into author, title and subject sequences and to file these items into Adult and Juvenile catalogs. Copy locations were added to the catalog at this time.

A description of the catalog module is given in Section III, p. 16 of this report.

Accomplishments

The BIBLIOS HAWAII catalog met its objectives:

1. It is creating in a single bibliographic file titles available in the system.

   Using the above file produced as a COM catalog, library patrons may ask for intraloan of books not in local libraries. It has provided opportunities for learning and reading not available before.

2. It has added titles on order to the catalog creating an opportunity for library patrons to reserve books to be received by the system.

   The inclusion of titles on order gives library patrons assurance that when these books are received and they will be given a fair opportunity to read these items.

3. It has created staff savings.

   The BIBLIOS HAWAII increased the receipt of titles and volumes flowing into public libraries. If the system had kept its card catalog, it needed 16,200 manhours to file an estimated 1,620,000 cards in 1981 and it would not have had these hours for filing. Libraries that automated its acquisitions and processing procedures but elected to keep card catalogs have run into arrears in the filing process. Catalogs that are not updated are useless in the provision of information concerning new books available in the library.

   The savings accured through the use of the COM catalog has enabled managers to keep the library usual library hours.

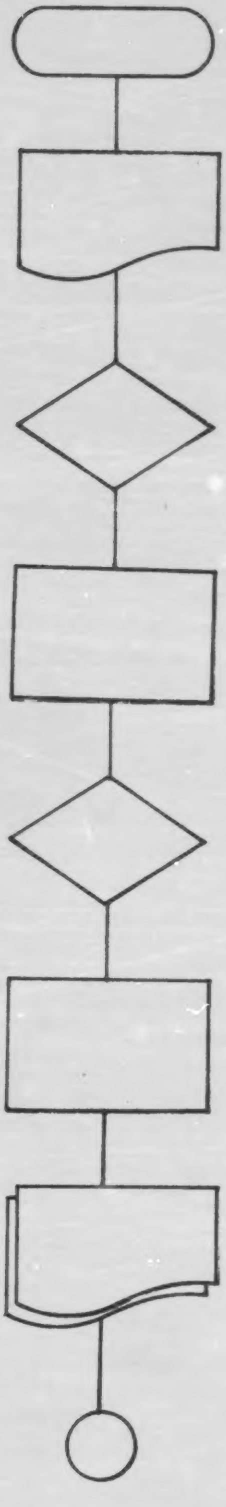
4. It has created a file that can be used for the conversion to an online circulation system.

   The files that create the BIBLIOS HAWAII catalog will be used in the operation of the circulation module and the public access inquiry system available in the next increment.

Evaluation

The catalog module now being used in the system was described as transitional. As the public libraries research and install an online public access catalog module, the catalog module, like the acquisitions cycle, will become absolete.

While the circulation system is being installed, the Office of Library Services intends to research and experiment an online catalog. The COM catalog has accomplished its objectives and at this time it needs to be improved and converted to a better system.



SERIALS

IV. SERIALS

Statement of the Problem

Due to the continuing nature of magazines, periodicals, newspapers, etc., serials present control problems that are distinct and different from monographs. Serial titles need to be listed and distributed to public libraries and to other libraries in the State so that these become available for use through the intralibrary and interlibrary loan mechanisms. Further, each issue of every serial title, which may be regular or irregular, needs to be checked in so that these single issues become available for reading and for loan.

In large research libraries, serials management is a formidable and highly necessary task since these titles contain new information on recent developments. In public libraries, serials control, while important, does not constitute as major a need as the circulation and catalog systems.

Objectives

The objectives of serials control are:

1. To bring under control in a single file all of the serial titles purchased by the system.
2. To control the checking in of individual serial issues and to claim missing issues.

Methodology

The Office of Library Services has recently purchased through federal funds a word processor. Plans are being made starting in

July FY 1982 to machine file serial titles in the public library system using this equipment. The list will be reproduced and distributed to libraries. The complicated and difficult task of serials management will be done at a future date.

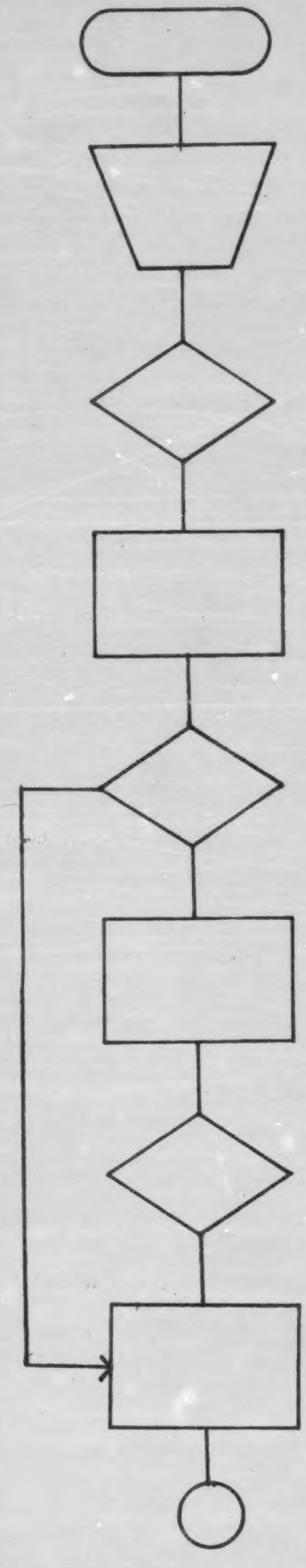
Accomplishments

Serials management must necessarily wait until the larger task of acquisitions, catalog, circulation and inventory control of books are accomplished.

The word processor will make the large task of listing serial titles simpler and faster.

Evaluation

The serial module must necessarily wait until projects that demand higher priority are completed. Acquisition of catalog cycles are massive tasks taking time and effort from serial control.



CIRCULATION

V. CIRCULATION

STATEMENT OF THE PROBLEM

The Kaiser Charge Method was installed in 1966 to tie the individual libraries into a single system allowing patrons to borrow books from any library and return it to the most convenient one in the organization.

System Description

The Kaiser Charge System begins with patron generated handwritten charge forms with one to four transactions per slip. The Library System presently uses two types of charge slips, a multiple form and a single copy version. (See Fig. 7). The patron writes in the author, title, and accession number. Thereafter, the library staffs engage in extensive manual tasks reading the handwritten slips, to check in, issue overdue notices, bills, reserves, etc. (See Figs. 8-13 for a system flow chart).

Functions

The Kaiser Charge System will perform the following functions:

1. Check-out
2. Check-in
3. Issue overdues
4. Issue bills
5. Reserve books
6. Some interloan

Costs

The manual system is labor intensive. The system spends approximately $40,000 a year in printing and distributing the Kaiser Charge slips. The estimated cost for clerical time necessary is shown in Table II. Due to the high cost and lack of personnel, branches in the public library system are six to eight months behind in issuing overdues and bills. Lack of proper tracking of patrons and books, late delivery and inaccuracies inherent in the system cause the Library System to lose over a million dollars annually in the current replacement value of books (See Table III).

Patron Dissatisfaction

Library patrons, especially children, resist the Kaiser Charge slips which must be filled out manually. The charge system takes patron time and effort to the extent that marginal library users often drop out of the reading habit rather than meet the demands imposed by the manual method.

Loss of Collection Quality

Deterioration in the quality of the public library collection is a result of the high cost rate in library materials. The loss of the estimated million dollars worth of books annually means that a significant percentage of the current and best books in the system are not being returned. Hawaii's library patrons not only have fewer books to read than patrons in other library systems, but may be using older, less current materials.

When the Hawaii State Library Branch collection was converted to machine readable form, only 48 percent of the books were in the Library of Congress (MARC) files started in 1976. It is reasonable to assume that much of collection predates the MARC files. In addition, Table IV taken from a recent consultant report shows that Hawaii's library patrons do not have as good a chance of finding recent books as library users in other sected states.

Inflexibility

Circulation figures for the past three years show that the Library System cannot keep up with the growing population and its need for more information. Circulation for the system went up 7 percent in 1977 attributable to an increase in book funds and the operating automated BIBLIOS HAWAII system which was responsible for the rapid processing of the books. Circulation rose another 5.72 percent in 1977/78 when the microfilm catalog was introduced giving library patrons a wider selection of titles.

The periods of circulation growth is being followed by seasons of slow growth. Taxed to the limit, librarians and clerical personnel have fallen behind in issuing overdues and in collecting books from the patrons. The Kaiser Charge System can no longer grow to meet the continuing demands of the information seeking population (See Fig. 14).

Lack of Fines Management

HRS 312.5 providing for fines and charges for lost materials cannot be practically implemented with the manual system. Libraries that are now six to eight months late in issuing overdues and bills cannot practically meet the deadlines necessary for the collection of fines. The manual system must also depend on a typed delinquent list which must be checked before suspect patrons are cleared and allowed to borrow books. The implementation of HRS 312.5 will be difficult with the manual operating system.

Alternative Solutions

The Office of Library Services considered three alternatives:

1. The purchase and installation of a turnkey, online circulation system.

   Turnkey means vendor supplied hardware and software ready to operate with little or no modifications. Lacking planning and computer programming manpower, this solution would provide the Library System with a complete operating system.

2. Partial automation of the circulation system through in-house development and installation.

   The Library System would plan and program services to file charge slips and date due forms. While not entirely satisfactory, this solution would reduce backlogs in overdues and bills to about half the current rate.

3. Status quo.

   The status quo would be a forced alternative to be relied on only if no funds or other help would be available to even partially alleviate the desperate situation in overdues and bills.

The Office of Library Services elected to request the state administration and the Legislature for a turnkey, online circulation system to be implemented in phases. (See Figs. 19-23)

OBJECTIVES

The objectives of an automated circulation system are to:

1. Extend services to the general public through control of the circulation system. This would mean:
    a. Wider selection of books available and subsequent circulation growth. (See Fig. 15 for projected growth)
    b. More copies of books available for the reason above.
    c. Prompt overdue notices and bills enabling reminding patrons to return books before the items are misplaced.
    d. Prompt intraloan services enabling patrons to borrow books from all libraries in the system.
    e. Elimination of handwritten charge slips enabling patrons to check out book more efficiently.
2. Control the circulation system without adding more staff to the public library patron service circulation units at the present time. This would mean:
    a. Machine readable data base and inventory from which staff and patrons can select materials for use.
    b. Computer printed overdues and bills saving staff time.
    c. The ability to track books, recall, reserve, hold, etc.
    d. Speeding up the check out and check in procedures so that staff time can be used for direct patron services.
3. Install and implement a fines system to control delinquent patrons. This would include:
    a. Overdue notices and bills
    b. Delinquent patron stops which identify and prevent these patrons from borrowing more books.
    c. Fines management, accounting, and reporting.
4. Aid in the overall management of libraries through statistical reports. These would include:
    a. Circulation statistics, by branch and system.

   b. Types of books circulated.

   c. Number of patrons registered.

5. Implement as far as possible other related areas for automation listed in p. 1. The following are areas that needs investigation.

   a. Control of the indexing of Hawaiiana materials through use of the programs designed to present the bibliographic data.

   b. An internal communications network achieved by using the computer and terminals to send administrative messages to and from the library units.

   c. Development of a management information system using the same hardware and operations software.

6. Implement an interlibrary cooperation network. The circulation system can be shared with other libraries in the state to:

   a. Install an interlibrary loan network. Librairies with terminals can dial into the system to locate and reserve books in the public libraries. Units in the Office of Library Services will also be able to send messages requesting the loan of materials or services from other libraries with terminals.

   b. Share the circulation system with libraries outside of the public library system. In order to save on the high cost of computer hardware and telecommunications, libraries, particularly, the neighbor island community colleges, may at minimum cost use the public library circulation system, share in the loan of library materials with the public libraires and share in the management reports resulting from the circulation system.

7. Meet User requirements.

   User requirements as determined by the Feasibility Study conducted by Hank Epstein, October, 1980 are as follows:

FUNCTION

CIRCULATION FUNCTION
Check-out
Renewals
Check-In
Fine & Fine Accounting
Reserves (Titles)
Reserves (Specific Copy)
Patron Notices
On-Line Patron Files
On-Line Title Files
Prompts - Multi-level
Prompts - Help Command
Holiday Provision

PATRON NOTICES
Format Flexibility
Wording Flexibility
Foreign Languages
Overdue Notices
Final Notice (Bill)
Reserve Notice
Reserve Cancel Notice

MANAGEMENT REPORTS
Reports by Branch
Monthly System Totals
Year-to-Date Totals
Percentage Calculation
Patrons by Type
Patrons by Residence
Patron List

CIRCULATION REPORTS
By Material Type
By Call Number Groups
By Patron Type
By Patron Geog. Location
By Time and/or Terminal
Missing Items
Items Loaned to Another Branch
Purchase Alert Report
List of Current Reserves
Reserve Statistics
Reserve Shelf List
Shelf Clearance Report
# Overdues and Bills

FINE ACCOUNTING
Fines Collected
Fines Forgiven
Patrons With High Fines

Fine Receipts
$ of Outstanding Fines

COLLECTION MANAGEMENT REPORTS
Items added/withdrawn
Inventory Control Report
# Items & Titles Owned By Branch
Item Activity Report
ILL Report

(Epstein, Hank: Automated Circulation System for the Hawaii State Library System, Feasibility Study - Phase II, October, 1980. P. 29-30.)

8. Purchase hardware that meets the following requirements:

   a. All hardware must be new, previously unused at any other site, and be of standard American manufacture.

   b. All hardware must be used as issued by the original manufacturer and unaltered in any way by the circulation vendor.

   c. Major hardware, including the processor, tape drives, direct access storage devices, terminals and printers, must be maintained in Hawaii by the manufacturer. Further, this manufacturer must have a field office with technical expertise and proven record of maintenance performance in Hawaii.

   d. The system configuration must include one central processor, not multiple processors.

   e. Hardware must not be dedicated to the circulation system. Hawaii must be able to use the equipment for other data processing activities.

   f. The system must be capable to handling 5 million in circulation with capability to control up to 8 million in several years.

   g. Hardware must be upgradable should Hawaii need to add capabilities to handle other library functions.

9. Purchase software that will meet the following requirements:

   a. Operations software.

      The circulation system must use the hardware manufacturer's operating software and the latest release of this operating software. All compilers and programs must be run by this operating system.

   b. Applications software.

      Hawaii must own software with license for perpetual use without additional royalty, copyright, service fees or other charges.

The Contractor must therefore:

1) Provide language under which the applications software is written and whether or not the equipment manufacturer supplies compilers assemblers.

2) Provide any enhancements or subsequent software releases without additional charges or royalty.

3) Provide complete system documentation including data base description, file layouts, file linkages, response layouts, program compilations, source codes, logic charts, program descriptions and all utility programs.

4) Place all applications software in escrow, granting the library access without restriction in the event the Contractor should go into receivership or otherwise terminates business.

5) Hawaii must be able to implement other applications software on the system. The vendor maintains only the vendors supplied software.

6) Provide that the applications software interface and use the products of the State's batch order and catalog system: BIBLIOS HAWAII.

7) Have message sending capabilities to transmit messages from one agency to another and from one library in the public library system to another library outside the system.

Response Times

FUNCTION	AVERAGE LOAD	PEAK LOAD
Check-out	less than 2	4
Check-in	less than 2	4
Holds	3	5
Intraloans	3	5
Inquiry functions (locations patron, items)	5	10

The items are listed in priority order.

Growth Capabilities

The system must be capable of:

a. Adding libraries outside of the public library system, including academic libraries

b. Adding an online catalog system for the public libraries.

c. Using the hardware to display online a newspaper index for the public libraries.

10. Provide training to enable the public libraries to run the system.

The Office of Library Services requires training for the following:

a. Library Administrators

Included here are the State Librarian and immediate staff: district administrators, HSL director, Library for the Blind and Physically Handicapped director.

Training must consist of the capabilities of automatic data processing and the circulation control system, its general capabilities and ability to meet local needs.

b. Data Processing Staff

Included here is the Systems Manager and all data processing staff. Training must include the general capabilites of the system, the ability to meet local needs, hardware and software operations and general maintenance.

c. Library Line Supervisors

Included here are the heads of libraries and major library units who will be directly responsible for the circulation equipment and procedures. This training must be thorough and detailed in order to permit the supervisor to be able to:

1) Readily perform all supervisory override and operator functions unassisted;

2) Know common causes for equipment lock-up or jam and the remedial action for each;

3) Identify and satisfy all points of library preventive maintenance on the hardware;

4) Instruct a changing mix of student assistants in the effective use of the transactor equipment; and

5) Be informed of all additional information felt necessary by the contractor relating to the transactor and its procedure to insure a successful operation.

6) User documentation for operation of the circulation control transactor shall be made available on or before these training sessions.

d. Operators

Included here are the library technicians, library assistants, and student assistants who will be responsible for operating the equipment in the libraries. Their training must be of sufficient depth and duration to install correct operating procedures and error correction to permit them to begin operation immediately and without assistance or the necessity of extensive retraining.

User documentation for operation of the circulation control transactor must be made available on or before the training sessions.

ACCEPTANCE TESTS

The system must pass the tests described below. All modifications and adjustments made to the system in order to pass any of these tests will be charged the contractor.

a. Functional performance tests

Each function will be tested separately by the public library staff to insure that every function is provided and properly executed by the system. The software will not be accepted by the State until all functional performance tests are completed and passed.

b. System reliability test

The system reliability test will begin when all parts of the system are successfully installed and tne functional performance tests have been completed. The system must operate for 90 consecutive working days at 98 percent level effectiveness, 72 hours a week. Should the system fail at any time, the reliability test must begin anew. The Contractor will be allowed 10 (ten) calendar months to complete this test.

c. Full-load acceptance tests

The system will run one full-load computer simulated acceptance test for 7 million plus.

METHODOLOGY

The circulation system will be installed by a project team. The core of the Project Team was established to purchase, install and maintain BIBLIOS HAWAII. Due to the size of the circulation system, the Project Team will be enlarged and personnel added so that this task can be executed properly.

The project team consists of:

1. Project Leader.

   The head of Research and Evaluation Services serves as project leader. The leader plans, coordinates and manages all activities concerned with this project. The leader serves as liaison between the contractor and the Office of Library Services and between other agencies in the State and the public library system for purposes of this project. The project leader works with the administrative staff to manage the installation of the circulation system.

2. Systems Manager.

   The Programmer V, Research and Evaluation Services, is the Systems Manager for this project. The Systems Manager controls all technical data processing activities, is in charge of all of the hardware, including the central site equipment, and serves as liaison for the project with the contractor's Systems Manager. A federally-funded Programmer III is being requested to aid the Programmer V. The budget request for 1983-85 includes a generally-funded Systems Analyst.

3. Operations Manager.

   The head of the Centralized Processing Center serves as Operations Manager. He controls and directs all staff engaged in data base building and conversion from manual to machine readable inventory records. He will direct the following two teams:

   a. Bibliographic data conversion team.

      This team will catalog, edit and process for input all new titles located in the branches that are not included in BIBLIOS HAWAII. These include titles added to branches before November 1976 that were not in the Hawaii State Library Branch, which was previously converted, gift books and other miscellaneous items. The team consists of two librarians and two library assistants.

b. Circulation inventory conversion team.

Part of this team will move from branch to branch assisting in the conversion of the inventory to machine readable form and in the training of library staffs to operate the circulation system. The team consists of:

Librarian II: This position will assist branches in adding bar codes and entering the inventory to the central files.

Librarian II: This position will assist branches in preparing to automate and ease the other libraries in the conversion effort.

Library Assistant II (2 positions): These positions will be located at the Centralized Processing Center and will manage overdues, apply bar coces to new books, and serve as general assistants in operating the computer.

Most of these positions will be federally-funded. The following positions need to be state funded in the future since these are considered permanent positions: Programmer V, Programmer III, Library Assistant II (2 positions) engaged in the application of bar codes, overdues management and in operating the computer. Fig. 16 shows the Project Team.

4. User Committee.

The User Committee consists of interested employees from the public library system representatives from other library agencies and the general public. The User Committee assists in evaluating procedures, operations, procedures and activities on an on-going basis and provides user input to the system.

The project will install a circulation system through contract services. The Contractor will be required to appoint a Project Manager and Systems Manager to work with the Office of Library Services Team.

PROJECT STATUS

The project has accomplished the following:

1. Trained employees within the Office of Library Services in anticipation of a circulation system through workshops and demonstations of candidate systems, 1979-82.

2. Worked with the Department of Budget and Finance, Electronic Data Processing Division, in the research and review of circulation systems, 1979-82.

3. Conducted a feasibility study through consultant effort. Hank Epstein, President, Information Transform Industries, 1992 Lemnos Drive, Costa Mesa, CA 92626 conducted a feasibility study in 1980.

4. Received Board of Education approval for the project, 1981.

5. Established criteria for a circulation system, 1980.

6. Requested and received approval from the Governor's EDP Advisory Committee, 1980-81. The circulation system for the libraries is priority #60 for the Governor's EDP Advisory Committee.

7. Requested and received from the 1982 Hawaii State Legislature $702,194 for the installation of the circulation system in the following libraries: Kaneohe Regional Library, Kailua Community Library, Waimanalo Community/School Library and the Hawaii State Library.

8. Requested and received $251,000 in federal funds to be used in FY 1983 largely for personnel in the installation of the circulation system.

9. Requested and received sole source permission to purchase the ULISYS circulation system, 1983.

The Office of Library Services is ready to install the first phase of a circulation system that will become statewide in 1985.

INSTALLATION

Selection

The Office of Library Services requested and received permission from the Department of Accounting and General Services to purchase through sole source a circulation system from Universal Library Systems, 205-1551 Bellevue Avenue, West Vancouver, B.C. Canada V7V1A6. This system shall be hereafter referred to by its acronym: ULISYS. ULISYS meets all of the hardware and software requirements:

1. All hardware used is new and shipped directly from the manufacturer, Digital Equipment Company (DEC), to Hawaii.
2. The hardware is unaltered by the vendor and used as shipped from the manufacturer.
3. Major hardware, including the processor, terminals and printers, etc. will be purchased from and will be maintained by DEC with a field office in Hawaii. DEC has a technical staff based in Hawaii and has a proven record of maintenance for its equipment.
4. The hardware configuration includes one CPU: DEC VAX 11/780.
5. Hawaii need not dedicate the equipment for circulation use only. The system can use other data processing applications provided that the programs fit the hardware and operations software.

6. The system will handle Hawaii's full statewide circulation workload without adding another processor.

7. Hardware is upgradable through DEC should Hawaii elect other software applications requiring additional equipment features.

8. The system software includes the DEC VMS operating system, the RMS File Management System and other utility programs.

9. The ULISYS applications software including all programs and sources will become State property.

10. ULISYS will use bibliographic and inventory data from BIBLIOS HAWAII making it possible for the Office of Library Services to continue operating the acquisitions system for school and public libraries.

11. ULISYS will allow for interlibrary loan and communications. Libraries with terminals may dial in to the Centralized Processing Center's main computer to make inquiries regarding title and copy information and use the messaging system to make contacts with libraries in the public library system. Public libraries will also be able to use their terminals to contact the University of Hawaii, which will be furnished with a terminal, for the loan of library materials.

12. ULISYS will allow for libraries other than the units in the Office of Library Services to join the system. Terminals may be supplied by the joining library or through the federal Library Services and Construction Act, Title III Interlibrary Cooperation. Community colleges on the neighbor islands are prime candidates since there will be opportunities to share in the telecommunications lines already leased by the public libraries. This arrangement should allow for reduced costs and for more sharing of library materials and information.

Software to be Delivered

ULISYS will deliver and install all software and hardware to operate the following: circulation, messaging, 16mm film circulation and information referral services.

A description of the functions the system will perform follows.

USER REQUIREMENTS

CIRCULATION

Check-Out

Definition

The check-out procedure is the loaning of a library item to a valid patron for a specified length of time.

General conditions

Inputs to the system will be through an optically encoded patron identification label and an optically encoded item identification label. The system must also accept input of these identifiers by keying. These inputs must be supported by full on-line patron and materials inventory files. The encoded labels must be products generally available in the United States and used in most automated circulation systems. The system must be able to handle cataloged and noncataloged materials, e.g. paperbacks and other ephemeral materials.

Patron Input

Read patron identification

The patron identification label must be read from an optically encoded machine-readable label.

Manual entry of patron identification

The system must provide for manual entry, through a keyboard, of patron identification numbers.

Patron validation

The system must verify patron status to assure that the patron is acceptable to borrow items. Patrons not on file, patrons whose cards have expired, and patrons on a "restricted borrowers" file must be excluded at this point and the system must cause an audible signal. The system must display the reason for the block and provide for operation action before the check-out transaction can be completed.

If fines threshold is exceeded, audible signal. Also includes an overall trap.

Initial patron action

New patrons must be able to check-out items through operator action.

Special borrowers

The system must be able to check-out items to special borrowers, or to special conditions, e.g., mending, bindery, missing, hold, etc.

Secondary patrons

The system must be able to charge items to another branch which will subsequently check-out these items to patrons.

Store patron data

The system must store identification numbers and all other data associated with patrons and provide item-patron linkage.

File update

The system must update patron files and all files associated with patron input immediately upon completion of each transaction.

Action completion

The system must signal the completion of each transaction with an audible signal.

Item Input

Read item identification

The item identification number will be read from an optically encoded machine-readable label located on the item.

Manual entry of item identification

The system must also provide for manual entry, through a keyboard, of item identification numbers.

Item validation

The system must verify item identification numbers and assure that no exceptional conditions exist. Minimum exceptions include:

a. Item not on file.
b. Item already in circulation.
c. Item not available for circulation.
d. Item on reference.
e. Item missing.
f. Item on hold.
g. Item withdrawn.

Exception condition alert

The system will provide operator alert with an audible signal for an exceptional condition and display reason for the block.

Excessive materials alert

The system must provide an audible alert when a patron attempts to check-out more than the library specified number of items. The system must display the reason for the alert and provide for operator override of the condition.

Multiple item input

The system must be able to check out more than one item to a patron without repeating the input of the patron identification label with each new item.

Loan periods

The system will provide a schedule of multiple loan periods (minimum at least 12 (twelve)) avoiding all holidays and dates when the libraries are closed. The operator must be able to override system-set loan periods and manually input new due dates.

Store item data

The identification number for each item eligible for loan must be stored on file and must be able to be associated with appropriate patron information.

Update files

The system must update immediately after each item input transaction all applicable files.

Item renewal

The system must have the capacity to renew loan periods providing that no exceptional conditions result.

Action completion signal

The system must provide an audible signal at the end of each item input transaction.

Uncataloged materials

The system must be able to check out uncataloged materials such as paperbacks and McNaughton Plan books, etc.

Check-In

Definition

The check-in procedure is the removal of a library item from in-circulation status.

Read item identification

The item identification number will be read from an optically encoded machine-readable label located on the item.

Manual entry of item identification

Provide for manual entry through a keyboard for item identification numbers where labels are defective or missing.

Manually inputed identification numbers

Provide for discharge of items with identification numbers inputed manually through a keyboard.

Validate exceptional conditions

The system will verify the identification number to assure that no exceptional conditions exist. Minimum exceptional conditions to be provided for:

a. Item on hold.
b. Item not on file.

Validate item

The system will verify the item identification number and alert the operator when an item not owned by the library is discharged.

Exceptional condition alert

Exceptional conditions for an item will cause an audible alert and will require operator action before proceeding with check-in.

Overdue fines calculation

The system will update the financial obligations file. The system will provide a printout of the items overdue and the associated fines upon request.

Update files

The system will update all files associated with check-out and check-in immediately and remove the item from the in-circulation status.

Action completion signal

The system must provide an audible signal to alert the operator at the end of each check-in transaction.

INQUIRY

Definition

Inquiry is an operator/machine dialog used to search on-line files for titles, patrons and information germane to requests. The inquiry is entered via keyboard with information displayed on a cathode ray tube (CRT).

Items access points

Item inquiry can be made throught the following access points:

a. Call number
b. OLS number (unique title number)
c. Item label number
d. Title
e. Subject
f. Added author
g. Type of material
h. Search keys

Products of item inquiry

The item inquiry function must be capable of producing the following information:

a. Call number
b. Author
c. Title
d. Publication date
e. Subject
f. Item identification number (bar code label)
g. OLS number (unique title number)
h. Inventory, or list of holding libraries
i. Current circulation status of item
j. Borrower identification number if in circulation
k. Due date if in circulation
l. Hold status and number of corrent holds
m. Billing price per item displayed

Patron access points

Patron inquiry should be initiated with entry of:

a. Patron identification number
b. Patron's full name
c. Search key (partial name)

Products of patron inquiry

Patron inquiry must be capable of producing the following information:

a. Patron name
b. Patron identification number
c. Patron address
d. Patron category or status
e. Restricted borrower status

f. Outstanding financial obligations
g. Items on loan to the patron

Holds

Definition

The holds procedure reserves desired items for requesting patrons or requesting library. When the desired item is found or checked in, it is segregated and placed in a special location. The patron or library is then notified that the item is now available and will be reserved for a specified length of time. If the item is not called for, the item will be released for circulation or to the next patron on hold.

Placing holds

The system must have the capability to identify and place holds for items in circulation and items not in circulation.

Enter patron identification

The system must provide for patron identification entry either through a machine-readable label or throught a keyboard.

Patron validation

The system must validate patron status and assure that the patron is acceptable to place a hold. Excluded patrons will require operator intervention before proceeding.

Item inquiry

The system must be capable of providing all procedures described in INQUIRY.

Queue

The system must provide for multiple patron requests with a holds queue giving priority to first requestor. The system must also be capable of altering the queue algorithm with operator intervention.

Single copy queue

The system will provide for multiple patron requests for a single copy of a title giving priority to requesting date.

Multiple copy queue

When holds are being held for multiple copies of a title, priority will be by requesting date in the following order:

a. Patrons in a single branch
b. Patrons in the same region
c. Patrons on the same island

Availability notice

The system will provide a written notice to be mailed to patrons notifying that the title on request is on hold for a specified number of days.

Cancellation notice

The system must provide a written notice to be mailed to patrons cancelling holds if the patrons fails to check-out the book within the specified number of days.

Recall

The system must be capable of recalling books in circulation.

Holds list

The system must be capable of producing a printout of all items on hold and the number of patrons requesting items on hold.

Holds for libraries

The system must be capable of providing holds for libraries within the system and outside of the system.

INTRALOANS

Definition

Intraloans are loans from one library to another within the system. Procedures for holds will cover intraloan procedures.

INTERLOANS

Definition

Interloans are loans from one library within the system to another library outside of the system or vice versa.

Check-out

The system must provide for check-out of items borrowed from another library to a patron.

Check-out

The system must provide for check-out of items borrowed from another library outside of the system.

Exceptional condition alert

The system must provide an audible alert to indicate to the operator that a book belonging to another library outside of the system is being checked-in. The system must display the owning library and address.

OVERDUES

Definition

Overdue items are those not returned by date due and include "lost" items. The purpose of overdue processing is to enforce the loan regulations for library items.

Overdue check-in

The system must be capable of all procedures required in CHECK-IN. as well as compute overdue fines, bills, and update records.

Overdue alert

The system must trap overdues and alert the operator with an audible signal.

Compute fines

The fines are subject to change and the capability of revision must be included with the system, Computation should be based on

CHECK-IN date, DUE date. The system must handle at least five different fine schedules. The system also must be capable of operator override and discounts.

Remove record from in-circulation status

The system must be capable of removing an overdue record from in-circulation status.

Send patron fines notice

The system will provide for the creation of notices indicating fines for excessive use of an item or items.

Update patron overdue record

The system will provide for updating the patron record to indicate that the patron has library items overdue and that fines are due at the library.

Update restricted borrower data

The system will keep and provide for the updating of the restricted borrower record according to pre-established thresholds set by the library limiting the number of items permitted on loan and overdue.

Billing process

The system will have the capability of setting a threshold at the library's option representing the number of days an item can be overdue before the item is considered lost and a bill is sent to a patron.

Bills production

The system will generate bills to be sent to patrons indicating the total dollar amount due for overdue items and for items lost.

Accounting

The system will have an accounting module keeping all funds collected branch by branch, cumulated by region and system. The system will account for fines forgiven branch by branch

Update patron bill record

The system will provide for updating the patron record to indicate that a bill has been sent and to identify the items overdue and/or lost.

Languages

The system must be capable of producing bills in 10 different languages using the roman alphabet for limited and/or non-English speaking patrons.

Overdue notice and bill production

Overdue notices and bills must be produced on postcards or mailable forms and filed by zip code and carrier route numbers.

Management Reports

Definition

Management reports are hard copy documents reporting on the system performance.

Statistics

The system must produce the following statistical reports:

a. Items circulated by branch, region, system.
b. Items overdue by branch, region, system.
c. Items lost by branch, region, system.
d. Overdue notices by branch, region, system.
e. Bills sent by branch, region, system.
f. Items added by branch, region, system.
g. Items lost by branch, region, system.
h. Items withdrawn by branch, region, system.
i. Holds by branch, region, system.
j. Interloans by branch, region, system.
k. Funds collected by branch, region, system.
l. Fines cancelled by branch, region, system.
m. Number of patrons by branch, region, system.
n. Patrons by type.
o. Number and patrons on restricted borrower list.
p. Check-outs by loan periods.
q. Circulation by patron category.
r. Items circulated by call number, by branch, region, system.
s. Recalls by item.
t. Statistics by terminal.
u. Statistics by time of day, day, month, year.

v. Have lists and reports by request.
w. Patron file and history printouts.

Bibliographies

The system must have the capacity to produce bibliographies by:

a. Classification number
b. Author
c. Title
d. Subject
e. Collection location
f. Series
g. Language designation
h. Owning library

Items withdrawn

The system should produce a list of items withdrawn and/or lost from the system.

System performance reports

The system should produce reports giving system performance by number of jobs done, system down times, etc.

Purchase alert

The system should produce reports indicating the need to purchase additional copies when the holds list goes beyond a library set threshold.

FILES

Definition

Files refer to major record divisions: title, item, patron.

Title file

The title file must produce the following information:

a. Call number
b. Main entry
c. Title
d. Publication date
e. Series
f. Publisher

g. Subject headings
h. Added entries
i. Edition
j. OLS number
k. Item identification number
l. Library of Congress card number
m. ISBN number
n. Material type
o. Author/title search key
p. Frequency of circulation
q. Last activity for item
r. Copies and locations

Item file

The item file should contain inventory information including:

a. Label identification number
b. Owning branch
c. Secondary agency or library to which book may have been assigned.
d. Current loan status
e. Circulation restriction, i.e., reference, bindery, etc.
f. Last activity date
g. Frequency of circulation
h. OLS number
i. Number of copies and locations
j. Due date
k. Temporary location
l. Sending library
m. Loaning library
n. Hold status

Patron file

The patron file should contain the following information:

a. Name
b. Mailing address including zip code, carrier route
c. Telephone number
d. Name, address search key
e. Identification number
f. Language code
g. Borrowing category
h. Statistical category
i. Expiration date
j. Restrictions, if any
k. Geographic code for census tract
l. Sex and age group
m. Residency status
n. Registered library

o. Items on loan
p. Items overdue
q. Fines owed, if any

Messaging

The system must be capable of sending notices and messages from one library to another. These messages must provide for 1920 characters, or full standard screen.

Indexing

The system must provide program expansion and adjustment to include Hawaiiana indexing for at least the Honolulu Star-Bulletin, Honolulu Advertiser, the Garden Island and the Hilo Tribune Herald. The system must maintain and display index files for these periodicals for at least one year after which the system may elect to print and distribute the indexes keeping only one calendar year online.

16 mm Film Circulation

The system should handle a variety of call numbers and bibliographic format in order to allow for the circulation of 16 mm films to patrons from the Hawaii State Library. The system will include a reserve file for films and notify patrons when the film is available.

Information Referral Services

The system must be capable of handling information referral services for the general public. The system programs should be able to handle public announcements, calendars, and service agencies. The Office of Library Services does not intend to activitate this function immediately but requires the capabilities for future expansion.

ULISYS will deliver all programs, sources, and all software necessary to run the system. ULISYS will maintain these programs and provide the Office of Library Services with all modifications, enhancements, etc. The Office of Library Services will pay an annual maintenance fee to ULISYS. Any enhancements, modifications and changes made by Hawaii will also be shared with ULISYS.

Hardware to be Delivered

ULISYS will deliver the following hardware:

VAX 11/780
1 - RP07 disk drive
1 - DZ11-E 16 pos. multiplexors
1 - DD11-DK system unit backplane
1 - 285 LPM printer (central computer site)
23 - VT100 terminals
23 - Xcables for VT100
9 - X9300 barcode reader
4 - X9400 portable barcode readers
3 - Xdial in modems
7 - Printers for branches

The computer, terminals, and printers will be maintained through contract with the manufacturer, Digital Equipment Corporation.

Description of equipment to be delivered are included in the Appendix.

Acceptance Tests

The Office of Library Services will conduct the following acceptance tests:

1. Software functional acceptance tests.

   The Office of Library Services will review and test each function separately, using BIBLIOS HAWAII data.

2. Hardware acceptance tests.

   ULISYS will run a hardware operations test with the Office of Library Services Systems Manager.

3. Systems acceptance tests.

   a. Operational acceptance test.

      This will be conducted when the system contracted for is operational and has been running for 6 months.

   b. Full load acceptance tests.

      This will be conducted by the Office of Library Services with ULISYS to predict whether the system can run the full load of over 7 million.

Training

ULISYS will train the Project Team, including the Conversion Team, and the personnel in the first four libraries to be trained. ULISYS will provide for the training of administrative systems staff and line operators. ULISYS will provide a System's Manual and one Terminal Operator's Manual for each terminal purchased. Other libraries will be trained based on the system implementation schedule.

SYSTEM DESIGN

The central site equipment including the processor, disks, tape drive and printer will be located at the Centralized Processing Center, 690 Pohukaina St., Honolulu, Hawaii 96813. Public library units will have terminals, printers and light pens. Fig. 17 shows the computer room. Fig. 18 the interaction between the central site and the branches.

Fig. 19 shows the original number of branches to be converted to the automated circulation system. Figs. 20-23 show the system configuration and Fig.15 the total circulation the system is expected to handle by 1985.

The Office of Library Services will continue to use BIBLIOS HAWAII for the present for the control of acquisitions and bibliographic data. BIBLIOS HAWAII will continue to operate bi-weekly. Therefore, major bibliographic updates to the circulation system will be done every other week with daily updates only for major acquisitions. The microfilm catalog will continue to be issued on a quarterly basis. Fig. 24 shows the system interface with BIBLIOS HAWAII.

IMPLEMENTATION SCHEDULE

The target date for the first branch operation is January 17, 1983. In order to meet this goal, the following tasks need to be accomplished:

1. Contract negotiation and agreement: July, 1982.
2. Central computer site renovations: September 30, 1982.
3. Computer delivery and installation: October 30, 1982.
4. Branch location renovations: October 30, 1982
5. Data base conversion: November 30, 1982.
6. Branch equipment delivery and installation: November 30, 1982.
7. Branch (Kaneohe Regional Library) conversion: January 10, 1983.
8. Branch open to the public: January 17, 1983.
9. Future installations.

The project will close all regional, community and community/school branches for training and conversion. The Hawaii State Library, because of its size, cannot easily be closed and converted. Therefore, the conversion of the Hawaii State Library will be on a long-term basis to be done gradually during public service hours.

Each task is discussed separately in the following paragraphs.

Contract Negotiation and Agreement

All contract negotiation and agreements must be accomplished by the end of July. ULISYS will order the computer and equipment for the first phase immediately for delivery October 1. August through September will then be spent by ULISYS in the conversion of the bibliographic data base from BIBLIOS HAWAII to ULISYS. The Hawaii Project Team will accept and test each user function separately to see that all ULISYS circulation functional requirements are working with BIBLIOS HAWAII records. See Section V, pp. 38-51 for the circulation functional requirements.

Table V is the cost schedule.

Central Site Renovations

The computer will be located at the Centralized Processing Center, 690 Pohukaina Street. One of the offices will be converted to a computer room. The following must be done to make the room acceptable:

1. Air conditioning sufficient to keep the computer operating must be installed.
2. The rug must be removed and the floor tiled.
3. All equipment in the room must be relocated.
4. The window tiled in.
5. Electrical equipment installed.

Computer Delivery and Installation

The central site equipment will be inspected and installed to DEC specifications and the installation approved by the DEC engineer and the Electronic Data Processing Division, Department of Budget and Finance. ULISYS will run the equipment for a specified length of time to assure that it is delivered and operating satisfactorily. ULISYS will then load the data base and prepare for the first branch conversion.

Branch location renovations

In preparation for the automated circulation system, Kaneohe and Kailua libraries are to receive new circulation desks to replace the termite damaged installations. These circulation desks will be specially designed and paid for through federal funds. In addition, electrical and telecommunications equipment will be installed so that the terminals, light pens and printer can be operated.

Data Base Conversion

The bibliographic data contained in BIBLIOS HAWAII need to be converted to ULISYS format and files to be used in the circulation system. ULISYS will convert BIBLIOS HAWAII records to run in the circulation system. The Hawaii Project Team will test each function separately and accept the software. The functional requirements are listed in pp. 38-51 of this Section.

Branch Equipment Delivery and Installation

Kaneohe Regional Library will have five terminals. Four will be used for circulation. One is an inquiry terminal which will enable staff and public to look into the data base and review titles and copies for selection. The library will have one printer to give receipts for funds accepted for overdue fines and charges for lost books. The printer will be also used for interloans and for messaging.

Branch (Kaneohe Regional Library) Conversion

The Operations Manager, Takashi Akimoto, will send a Conversion Team Librarian to Kaneohe to train and assist staff in the application of bar codes and title and copy entry to the data base. Kaneohe Library will close 22 days. The staff will be trained in conversion techniques, link bar codes and books, and be trained for circulation to open for business January 15, 1983.

In the meantime, the Operations Manager will send another member of the Conversion Team, a Librarian, to the next Branch, Kailua Community Library to assist staff in coping with the additional workload caused by Kaneohe Regional Library closing and in advance preparation for the circulation system.

Future Installations

Terminals will be installed January 1, 1983 in the Hawaii State Library. This library will begin applying bar codes and entering title and copy information for books being returned through the existing circulation system. It will also register patrons. Hawaii State Library should be able to handle this conversion process within 8 months at which time it will be fully operational for circulation. Waimanalo Community/School Library will be converted to the automated circulation system during Spring Vacation, 1983.

In addition, the Hawaii Regional Library in Hilo, the Maui Regional Library in Wailuku and the Kauai Regional Library in Lihue are connected to the Hawaii State Library and the University of Hawaii by telex terminals. Interloan messages are sent through this terminal between these libraries. ULISYS will convert these terminals to the DEC VT100 terminals so that the Hawaii, Maui, Kauai regional libraries and the University of Hawaii can dial in directly to the computer to reserve books for interloan and to send messages to libraries with circulation terminals.

A proposed scheduled for the installation of all libraries is shown in Fig. 25.

PLANS FOR THE FUTURE

The Office of Library Services intends to request through the regular budget process for terminals and telecommunications costs for the rest of the libraries in the public libraries. Phase II will include the rest of the libraries in East and West Oahu and Phase III will include the neighbor islands. (See Figs. 20 to 23)

The system, when completed, should include circulation and interloan for all public libraries and community colleges on Kauai and Maui, should these institutions desire to join with the public libraries, Fig. 26 shows the completed circulation system.

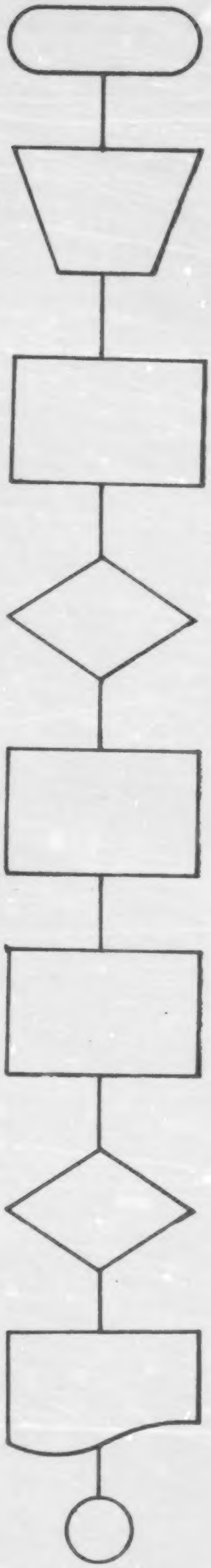
EVALUATION

The circulation system will be subjected to continuous evaluation. Criteria to be used include:

1. The system must meet all requirements included in the contract between the Office of Library Services and ULISYS.
2. The system must meet 100 percent of the basic minimum functional requirements listed in the contract and these functional requirements must be performed according to the satisfaction of the user libraries.

3. The system must meet schedules.

Evaluation shall be done by the User Committee and shall include at least user survey and one patron survey. The size of each survey shall be determined by the User Committee.



HAWAIIANA

VI. HAWAIIANA

Statement of the Problem

Residents of Hawaii have an interest in the management of Hawaiiana information. Materials that contain information on Hawaii and materials produced by local artist, writers, etc., are important to the population of Hawaii. Hawaiiana materials contain the history of the islands, describe the present and forecast the future. Libraries must consider as priority the acquisition, storage and distribution of materials considered Hawaiiana.

The automated acquisitions and catalog systems include Hawaiiana as contained in books and other cataloged library materials. The problem is the management of the additional materials contained in documents, newspapers, magazines, and in non-book format.

At the present time, the Hawaii State Library and other libraries in the system index the Honolulu Star Bulletin, the Honolulu Advertiser, the Garden Island (Kauai), the Hilo Tribune Herald and a selected list of periodicals. The major index to the Honolulu Star Bulletin and Advertiser is indexed and published regularly but there is considerable lag time before each issue.

Objectives

The objectives are to serve the Hawaiiana needs of the population by:

1. Producing on a timely, uninterrupted basis, the index to the Honolulu Star Bulletin and Advertiser and to present this information online to as many libraries as possible.

2. Acquiring and distributing information on other Hawaiiana acquisitions as efficiently and as speedily as possible.

Methodology

The Contractor for the circulation system, ULISYS, is charged with the inclusion of an indexing system. Indexing will be done by participating libraries online and the indexes will be displayed online for all libraries with terminals. The indexes will be removed each calendar year from the computer files, edited, printed and distributed to school and public libraries.

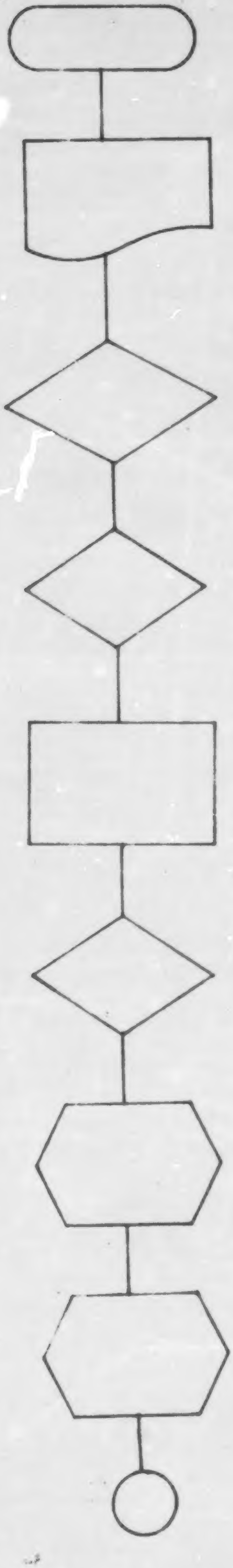
The following newspapers and magazines are presently indexed manually:

1. Honolulu Advertiser
2. Honolulu Star Bulletin
3. Hawaii Tribune Herald
4. The Garden Island
5. Honolulu Magazine
6. Aloha Magazine
7. Paka Paniolo
8. Kohala Midget

Fig. 26 shows the indexing system and its integration into the automated system.

Evaluation

Evaluation of the Hawaiiana indexing module will be done by User Committee. Criteria will be developed at a future date.



NONBOOK MATERIALS

VII. NON BOOK MATERIALS

Statement of the Problem

In addition to the traditional books, periodicals, pamphets and other materials, the Library System purchases quantities of non-book items in the form of microforms, films, filmloops, filmstrips, etc. All of these materials must be acquired, cataloged and made available to the general public.

Non-book materials can generally be handled using the print materials acquisitions, catalog and loan systems. The problems are personnel to handle these materials and space to store and process these materials.

Objectives

In the near future, the Office of Library Services intends to access control of the non-book materials in order to:

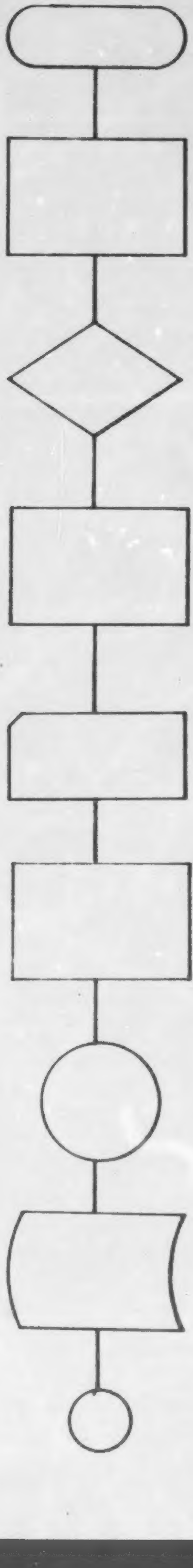
1. Estimate the space needed to handle these materials.
2. Personnel needed to acquire, catalog, and process these materials.
3. Other adjustments needed to use non-print information.

Methodology

The Office of Library Services will research and create an implementation plan for non-print materials after the installation of the circulation, online catalog, and management information systems.

Evaluation

The research and installation of this module will include criteria and evaluation methods.



MANAGEMENT INFORMATION

VIII. MANAGEMENT INFORMATION SYSTEM

Statement of the Problem

Act 150, SLH 1981, moved the administration of the public libraries from the Superintendent of Education to the Board of Education. The Superintendent and State Librarian has been in conference regarding administrative services to be transferred or to be shared with the Office of Library Services.

The Department is supplying budgeting, accounting and personnel management services at the present time. It is the intention of the Department and the Office of Library Services to make some adjustments in this situation.

The Office of Library Services finds the Department's budget cycles and personnel management systems geared to the school year. The public libraries find that they are budgeting for the coming biennium before the results of the current legislative sessions are announced. Budgets created in anticipation of funds received need to be changed depending on the legislative decisions.

Objectives

The objectives of a management information system are:

1. Control of budget cycles and budget schedules geared to public library year-round operational needs.
2. Control of personnel management.
3. Accounting control.

Methodology

The Office of Library Services intends to research, modify and install an automated management information system. The system will be acquired as a software package and the programs run on the computer purchased for the circulation system.

The choice of ULISYS for circulation enabled the purchase of a computer large enough to handle a financial system and personnel module to operate during the times when the circulation system is not operating.

The financial management system will require manpower resources, especially data entry personnel, although the major data input should be online from the administrative offices and local branches. It would also require the purchase, installation and operating of the data processing programs for finance and personnel.

Fig. 26 shows how a management information system fits into the hardware used by the circulation system.

Finance module

1. Equipment

   The financial system will use the central site equipment purchased for the circulation system.

   Additional equipment will include terminals for the District Offices, the Hawaii State Library, the Library for the Blind and Physically Handicapped and the central administrative offices.

2. Software.

The Office of Library Services will research available financial software packages to be modified and used by the Library System.

Costs

1. Equipment: 10 terminals at $1,800 each.

2. Telecommunications: $10,000 additional to the circulation system annually.

3. Software and installation: $15,000.

The Office of Library Services intends to include funds for a financial module in FY 1984-85.

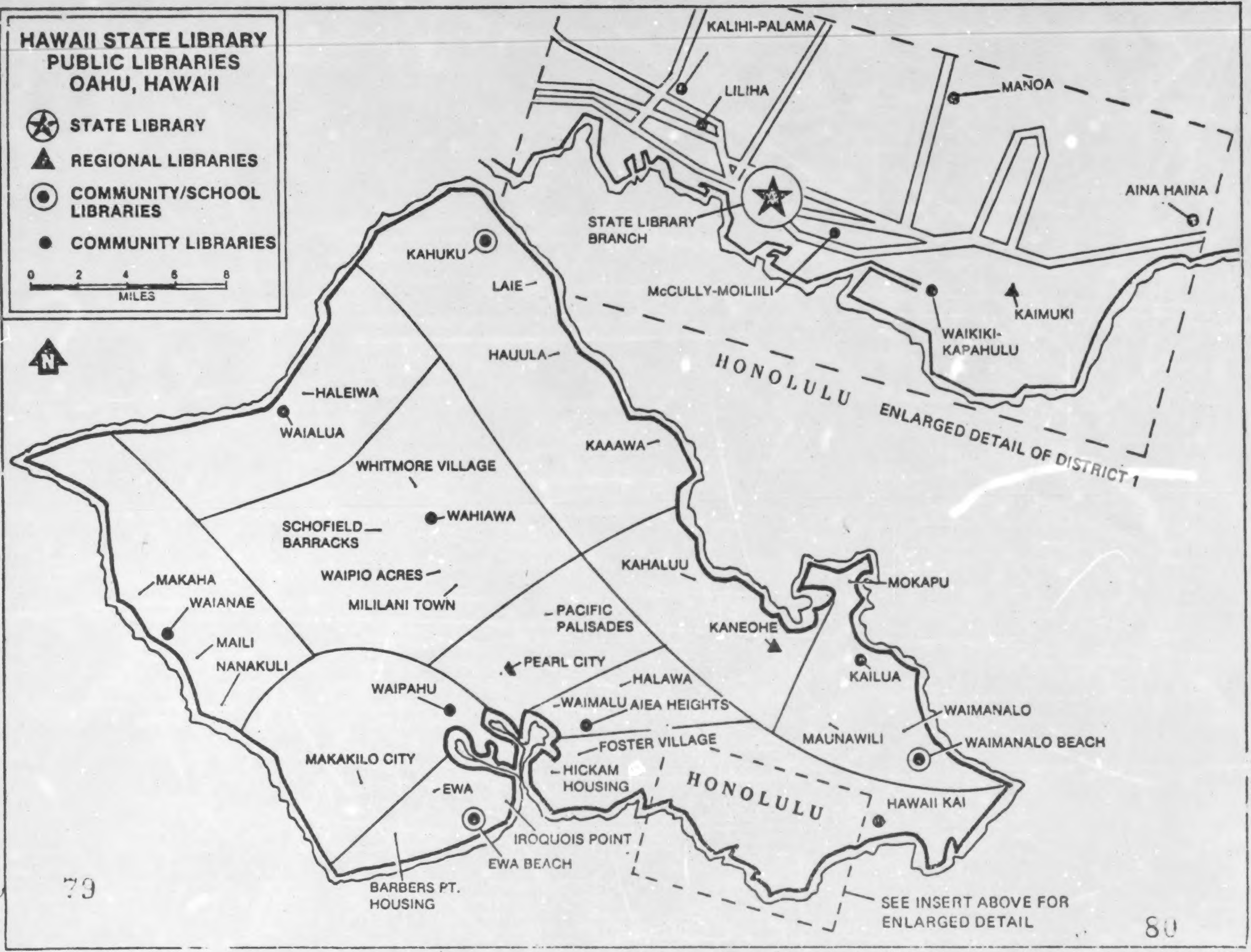
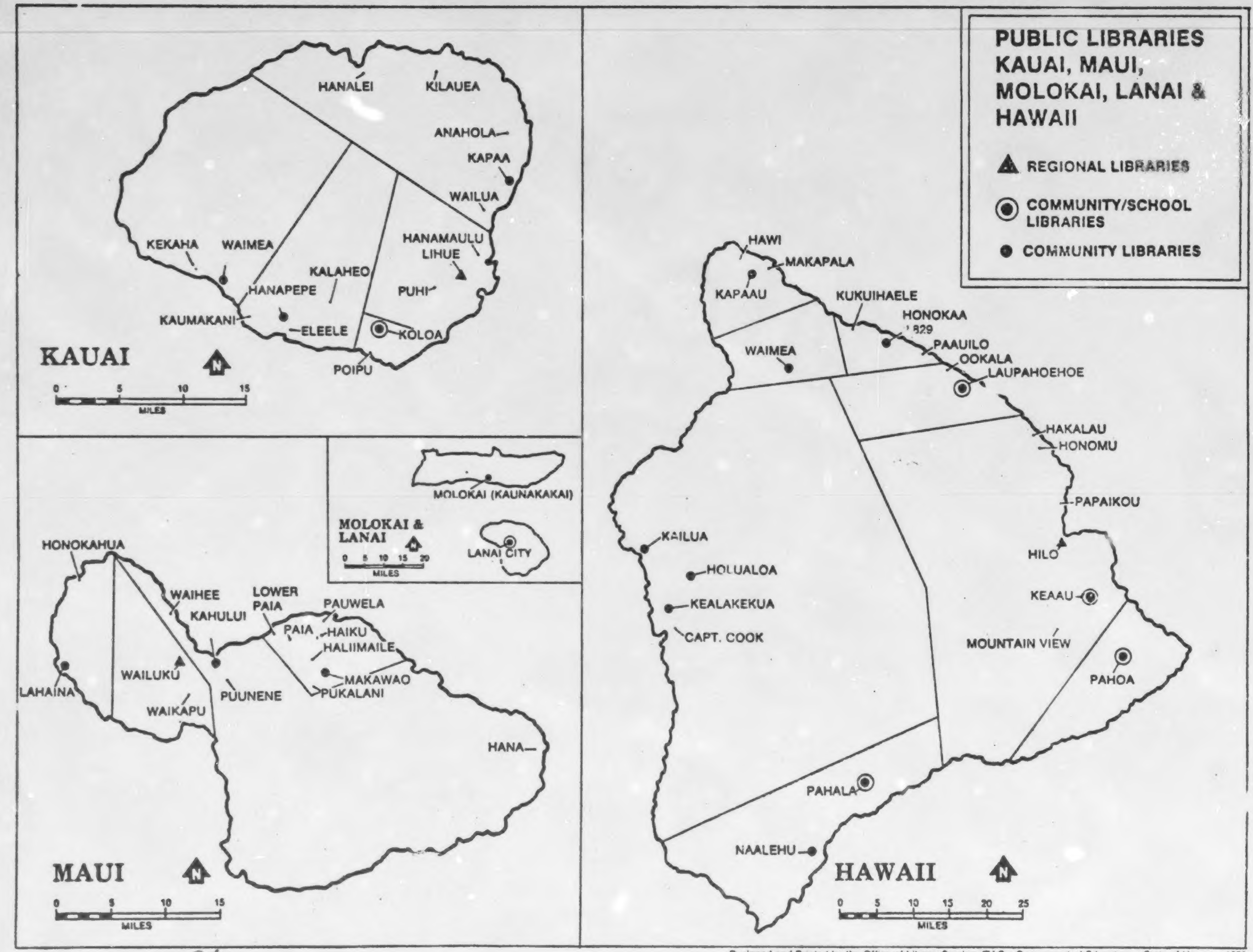

HAWAII STATE LIBRARY
PUBLIC LIBRARIES
OAHU, HAWAII
STATE LIBRARY
REGIONAL LIBRARIES
COMMUNITY/SCHOOL LIBRARIES
COMMUNITY LIBRARIES
0
2
4
6
8
MILES
N
KALIHI-PALAMA
LILIHA
MANOA
AINA HAINA
STATE LIBRARY BRANCH
McCULLY-MOILIILI
WAIKIKI-KAPAHULU
KAIMUKI
HONOLULU
ENLARGED DETAIL OF DISTRICT 1
KAHUKU
LAIE
HAUULA
HALEIWA
WAIALUA
KAAAWA
WHITMORE VILLAGE
WAHIAWA
SCHOFIELD BARRACKS
WAIPIO ACRES
MILILANI TOWN
MAKAHA
WAIANAE
MAILI
NANAKULI
KAHALUU
MOKAPU
PACIFIC PALISADES
KANEOHE
PEARL CITY
KAILUA
HALAWA
WAIPAHU
WAIMALU
AIEA HEIGHTS
WAIMANALO
FOSTER VILLAGE
MAUNAWILI
WAIMANALO BEACH
MAKAKILO CITY
HICKAM HOUSING
EWA
HONOLULU
HAWAII KAI
IROQUOIS POINT
EWA BEACH
BARBERS PT. HOUSING
SEE INSERT ABOVE FOR ENLARGED DETAIL

FIGURE 1

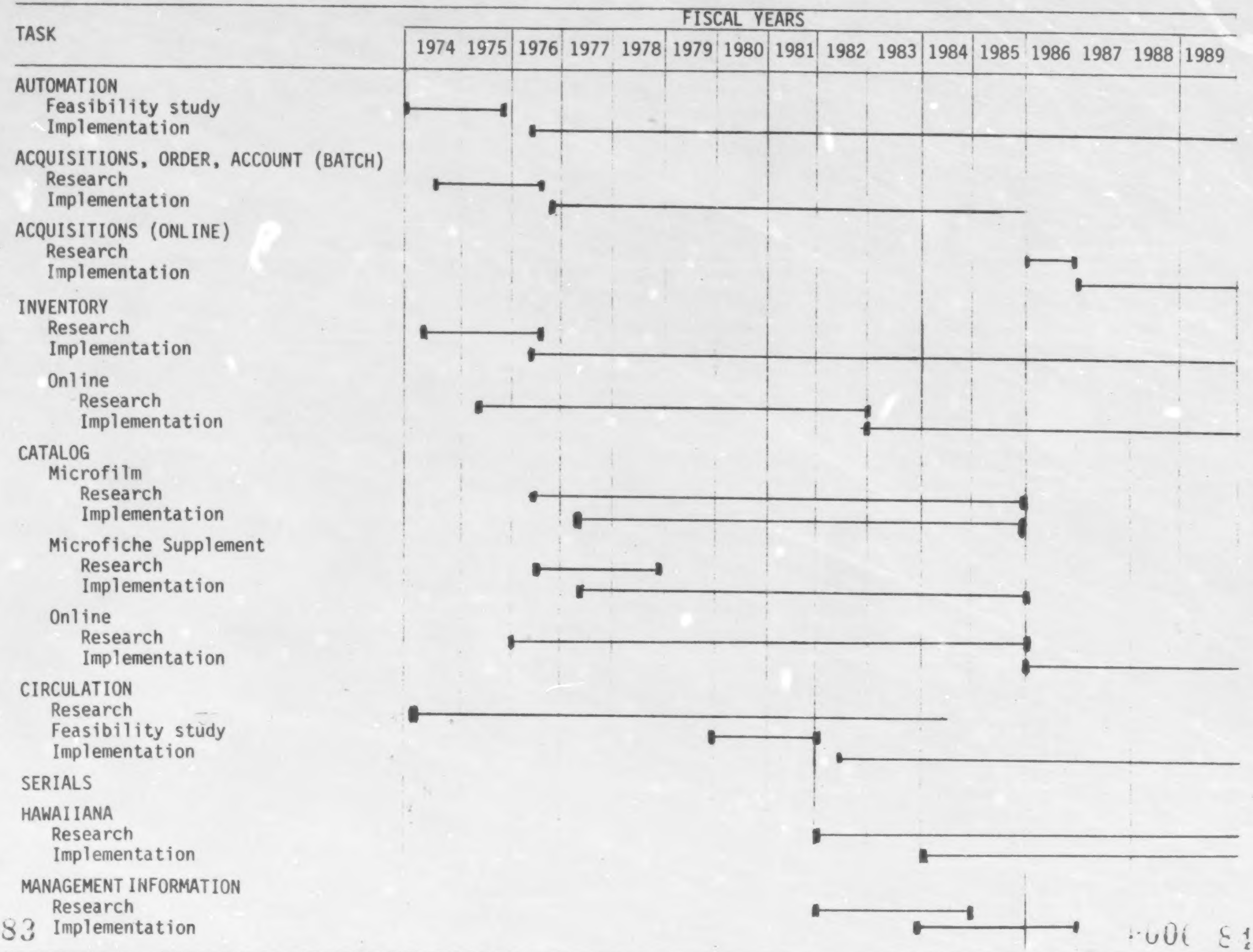
Designed and Printed by the Office of Library Services/TAC • Department of Education • State of Hawaii • [illegible]


PUBLIC LIBRARIES KAUAI, MAUI, MOLOKAI, LANAI & HAWAII
▲ REGIONAL LIBRARIES
◉ COMMUNITY/SCHOOL LIBRARIES
● COMMUNITY LIBRARIES
KAUAI
HANALEI
KILAUEA
ANAHOLA
KAPAA
WAILUA
HANAMAULU
LIHUE
PUHI
KEKAHA
WAIMEA
KALAHEO
HANAPEPE
KAUMAKANI
ELEELE
KOLOA
POIPU
0
5
10
15
MILES
MOLOKAI (KAUNAKAKAI)
MOLOKAI & LANAI
LANAI CITY
0
5
10
15
20
MILES
MAUI
HONOKAHUA
WAIHEE
LOWER PAIA
PAUWELA
KAHULUI
PAIA
HAIKU
HALIIMAILE
MAKAWAO
PUKALANI
WAILUKU
LAHAINA
PUUNENE
WAIKAPU
HANA
0
5
10
15
MILES
HAWAII
HAWI
MAKAPALA
KAPAAU
KUKUIHAELE
HONOKAA
1829
PAAUILO
OOKALA
LAUPAHOEHOE
WAIMEA
HAKALAU
HONOMU
PAPAIKOU
KAILUA
HOLUALOA
KEALAKEKUA
CAPT. COOK
HILO
KEAAU
MOUNTAIN VIEW
PAHOA
PAHALA
NAALEHU
0
5
10
15
20
25
MILES

Designed and Printed by the Office of Library Services/TAC • Department of Education • State of Hawaii • 1975

FIGURE 2

AUTOMATION DEVELOPMENT PLAN FOR PUBLIC LIBRARIES



Implementation Schedule

FIGURE 3

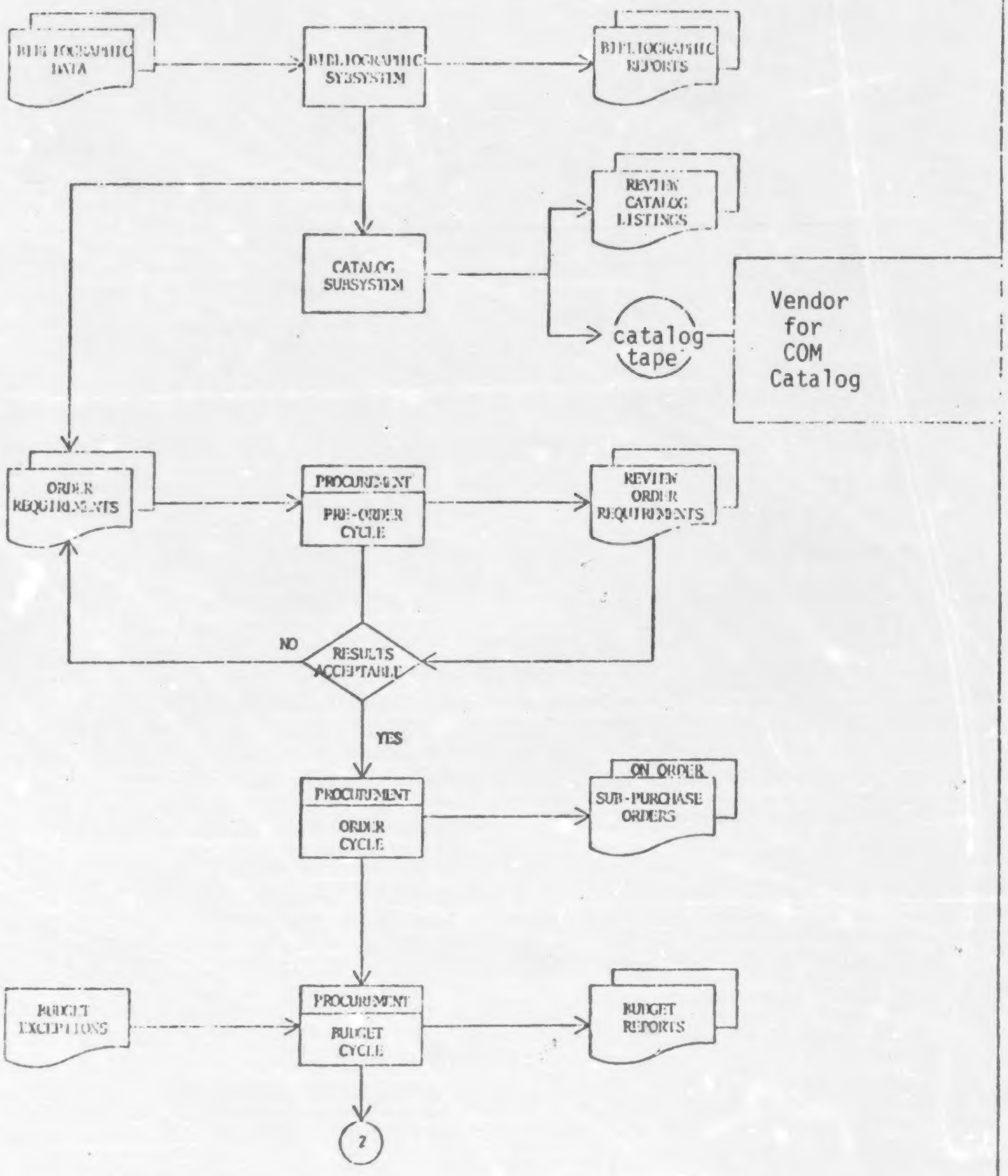
FIGURE 4

ELECTRONIC DATA PROCESSING DIVISION

TECHNICAL MEMO

Office of Library Services	Automated Library System	SYS. CODE EEF	PAGE 1 OF 3

BIBLIOS SYSTEMS FLOW


BIBLIOGRAPHIC DATA
BIBLIOGRAPHIC SUBSYSTEM
BIBLIOGRAPHIC REPORTS
REVIEW CATALOG LISTINGS
CATALOG SUBSYSTEM
catalog tape
Vendor for COM Catalog
ORDER REQUIREMENTS
PROCUREMENT
PRE-ORDER CYCLE
REVIEW ORDER REQUIREMENTS
NO
RESULTS ACCEPTABLE
YES
PROCUREMENT
ORDER CYCLE
ON ORDER
SUB-PURCHASE ORDERS
BUDGET EXCEPTIONS
PROCUREMENT
BUDGET CYCLE
BUDGET REPORTS
2

☐ PROPOSED ☐ ACTUAL

DOCUMENTED BY

APPROVED BY

DATE / /

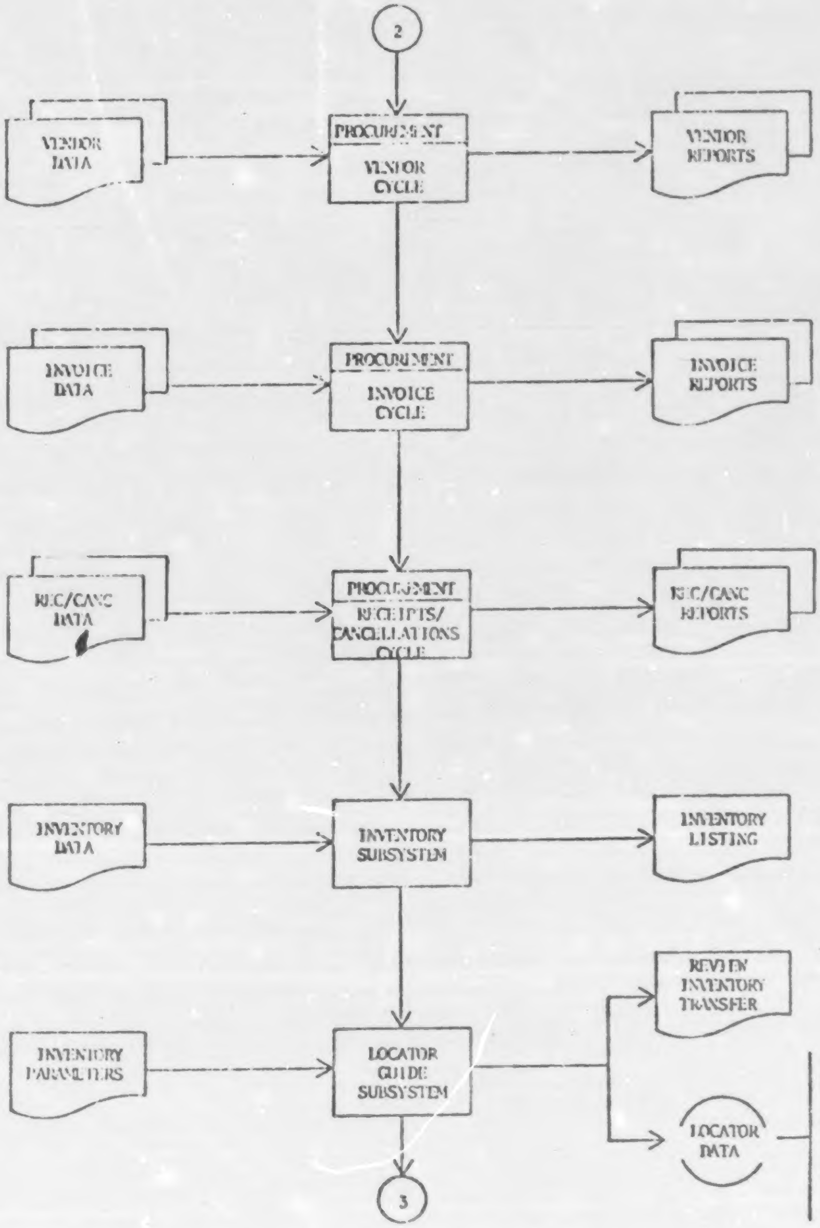
FIGURE 5

ELECTRONIC DATA PROCESSING DIVISION

TECHNICAL MEMO

Office of Library Services
Automated Library System
EEF
PAGE 2 OF 3

BIBLIOS SYSTEMS FLOW


2
VENDOR DATA
PROCUREMENT
VENDOR CYCLE
VENDOR REPORTS
INVOICE DATA
PROCUREMENT
INVOICE CYCLE
INVOICE REPORTS
REC/CANC DATA
PROCUREMENT
RECEIPTS/ CANCELLATIONS CYCLE
REC/CANC REPORTS
INVENTORY DATA
INVENTORY SUBSYSTEM
INVENTORY LISTING
REVIEW INVENTORY TRANSFER
INVENTORY PARAMETERS
LOCATOR GUIDE SUBSYSTEM
LOCATOR DATA
3

Merged with catalog and sent to vendor for COM catalog

☐ PROPOSED ☐ ACTUAL
DOCUMENTED BY
APPROVED BY 86
DATE / /

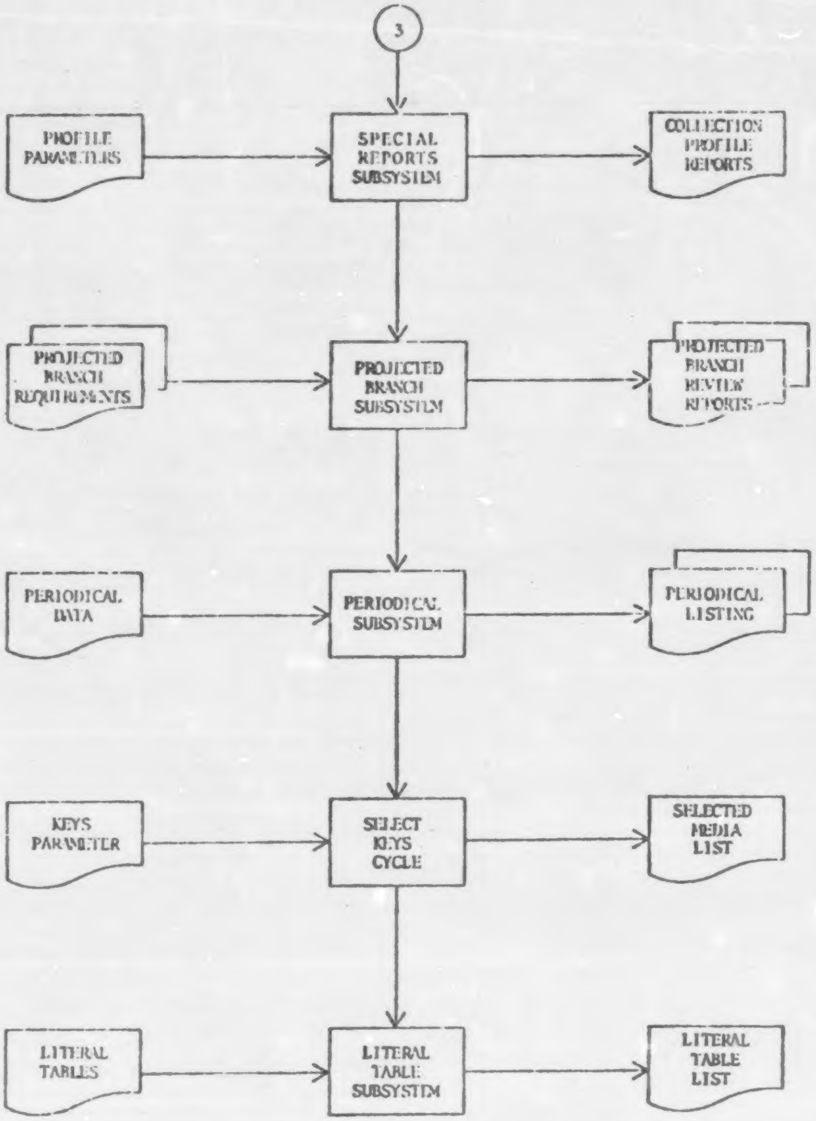
FIGURE 6

ELECTRONIC DATA PROCESSING DIVISION

TECHNICAL MEMO

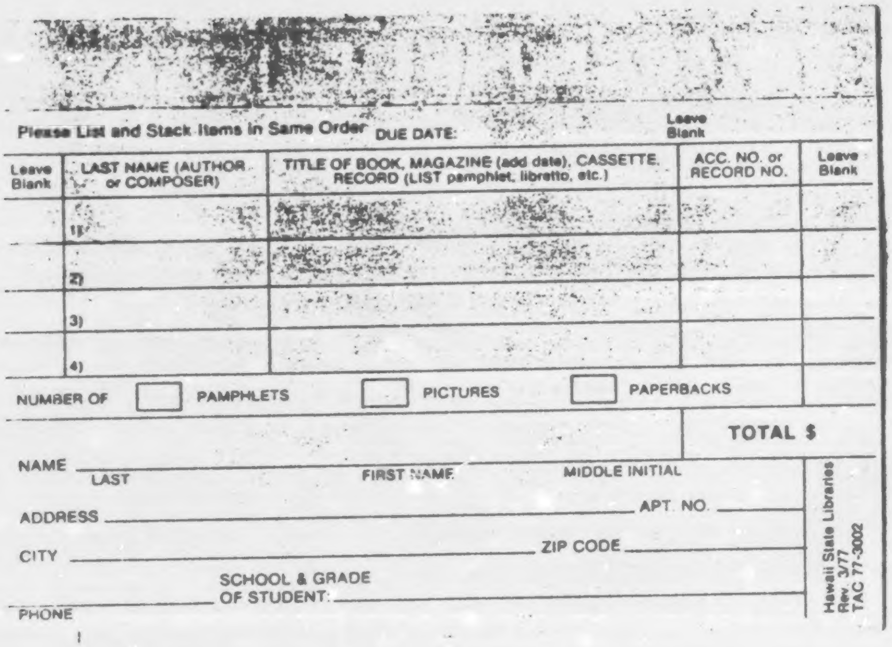
DEPARTMENT	SYSTEM	SYS. CODE	
Office of Library Services	Automated Library System	EEF	PAGE 3 OF 3

PROCEDURAL DESCRIPTION
BIBLIOS SYSTEMS FLOW


3
PROFILE PARAMETERS
SPECIAL REPORTS SUBSYSTEM
COLLECTION PROFILE REPORTS
PROJECTED BRANCH REQUIREMENTS
PROJECTED BRANCH SUBSYSTEM
PROJECTED BRANCH REVIEW REPORTS
PERIODICAL DATA
PERIODICAL SUBSYSTEM
PERIODICAL LISTING
KEYS PARAMETER
SELECT KEYS CYCLE
SELECTED MEDIA LIST
LITERAL TABLES
LITERAL TABLE SUBSYSTEM
LITERAL TABLE LIST

☐ PROPOSED ☐ ACTUAL	DOCUMENTED BY	APPROVED BY	DATE / /

FIGURE 7



[illegible]

Please List and Stack Items in Same Order DUE DATE: Leave Blank

Leave Blank	LAST NAME (AUTHOR or COMPOSER)	TITLE OF BOOK, MAGAZINE (add date), CASSETTE, RECORD (LIST pamphlet, libretto, etc.)	ACC. NO. or RECORD NO.	Leave Blank
	1)			
	2)			
	3)			
	4)			

NUMBER OF ☐ PAMPHLETS ☐ PICTURES ☐ PAPERBACKS

TOTAL $

NAME ____________________ LAST FIRST NAME MIDDLE INITIAL

ADDRESS ____________________ APT. NO. ______

CITY ____________________ ZIP CODE ______

PHONE ______ SCHOOL & GRADE OF STUDENT: ____________________

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Rev. 3/77
TAC 77-3002

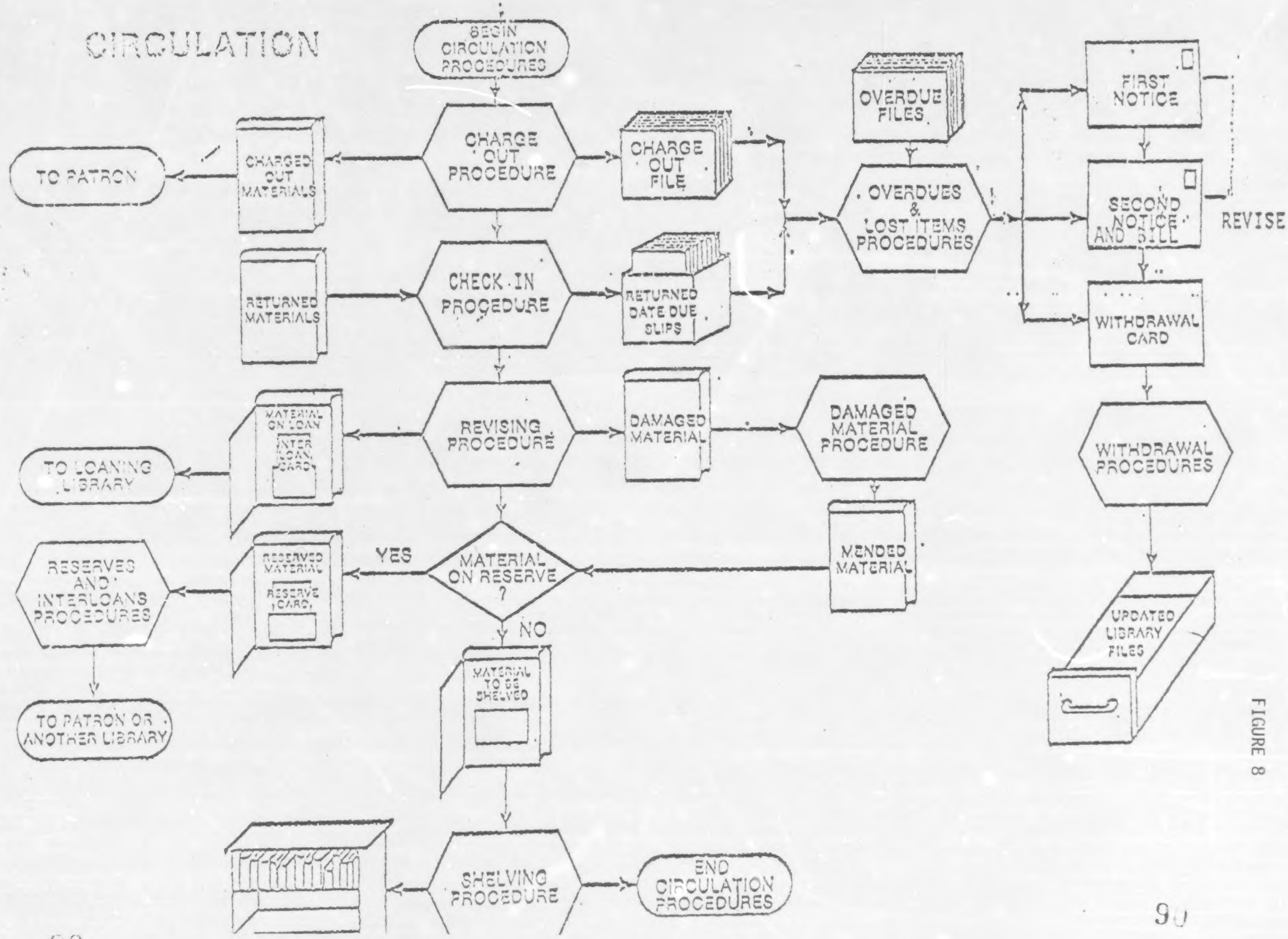

CIRCULATION
BEGIN CIRCULATION PROCEDURES
CHARGE OUT PROCEDURE
CHARGED OUT MATERIALS
TO PATRON
CHARGE OUT FILE
OVERDUE FILES
OVERDUES & LOST ITEMS PROCEDURES
FIRST NOTICE
SECOND NOTICE AND BILL
REVISE
WITHDRAWAL CARD
RETURNED MATERIALS
CHECK IN PROCEDURE
RETURNED DATE DUE SLIPS
REVISING PROCEDURE
MATERIAL ON LOAN
INTER LOAN CARD
TO LOANING LIBRARY
DAMAGED MATERIAL
DAMAGED MATERIAL PROCEDURE
WITHDRAWAL PROCEDURES
MATERIAL ON RESERVE ?
YES
NO
RESERVED MATERIAL
RESERVE CARD
RESERVES AND INTERLOANS PROCEDURES
TO PATRON OR ANOTHER LIBRARY
MENDED MATERIAL
UPDATED LIBRARY FILES
MATERIAL TO BE SHELVED
SHELVING PROCEDURE
END CIRCULATION PROCEDURES

FIGURE 8

FIGURE 9

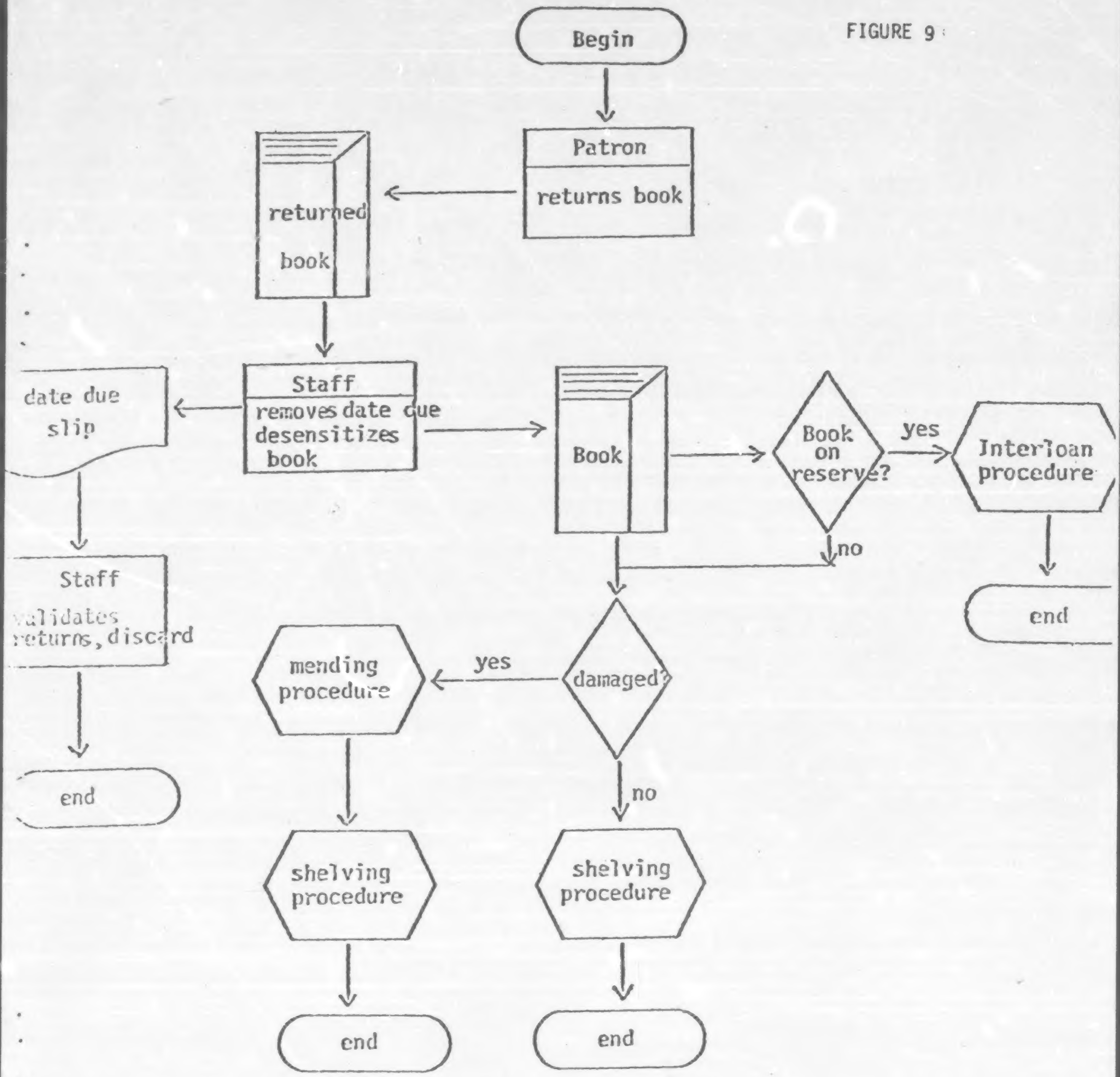
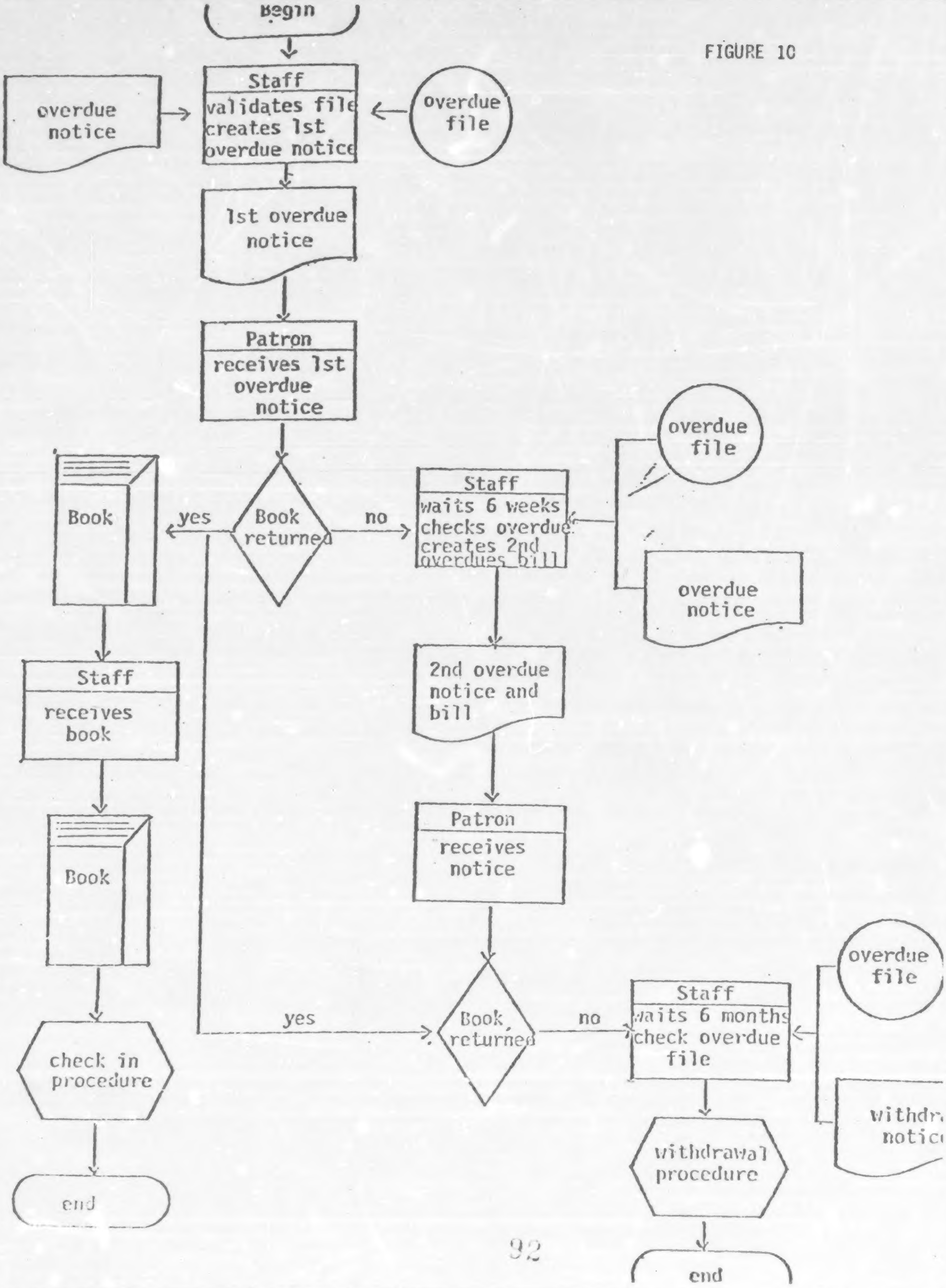

Begin
Patron
returns book
returned book
Staff
removes date due
desensitizes book
date due slip
Book
Book on reserve?
yes
no
Interloan procedure
end
Staff
validates returns, discard
end
damaged?
yes
no
mending procedure
shelving procedure
end
shelving procedure
end

FIGURE 10


Begin
Staff
validates file
creates 1st
overdue notice
overdue
notice
overdue
file
1st overdue
notice
Patron
receives 1st
overdue
notice
Book
returned
yes
no
Book
Staff
waits 6 weeks
checks overdue
creates 2nd
overdues bill
overdue
file
overdue
notice
Staff
receives
book
2nd overdue
notice and
bill
Patron
receives
notice
Book
check in
procedure
end
yes
Book
returned
no
Staff
waits 6 months
check overdue
file
overdue
file
withdr
notic
withdrawal
procedure
end

CHARGE OUT PROCEDURES

FIGURE 11

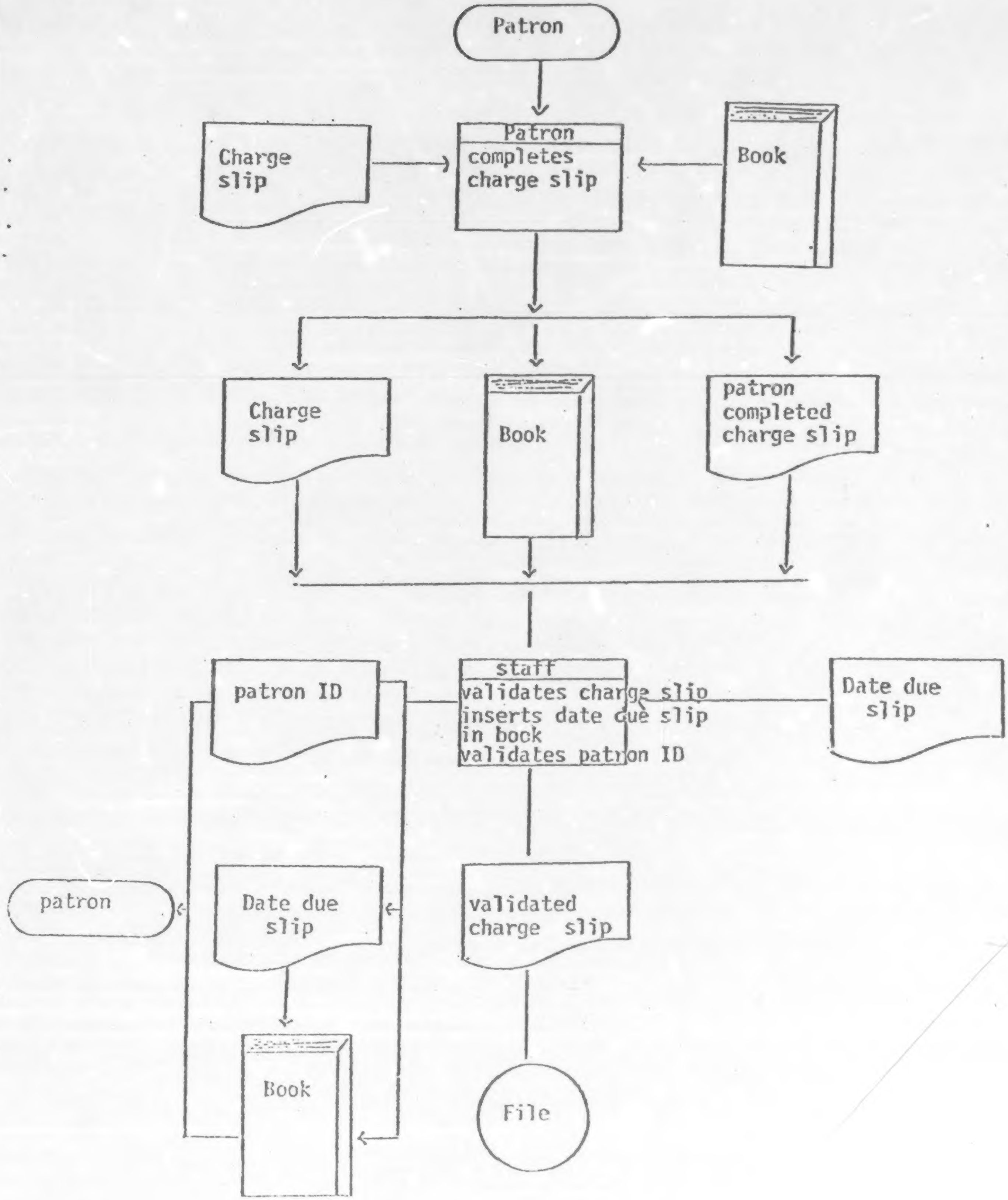
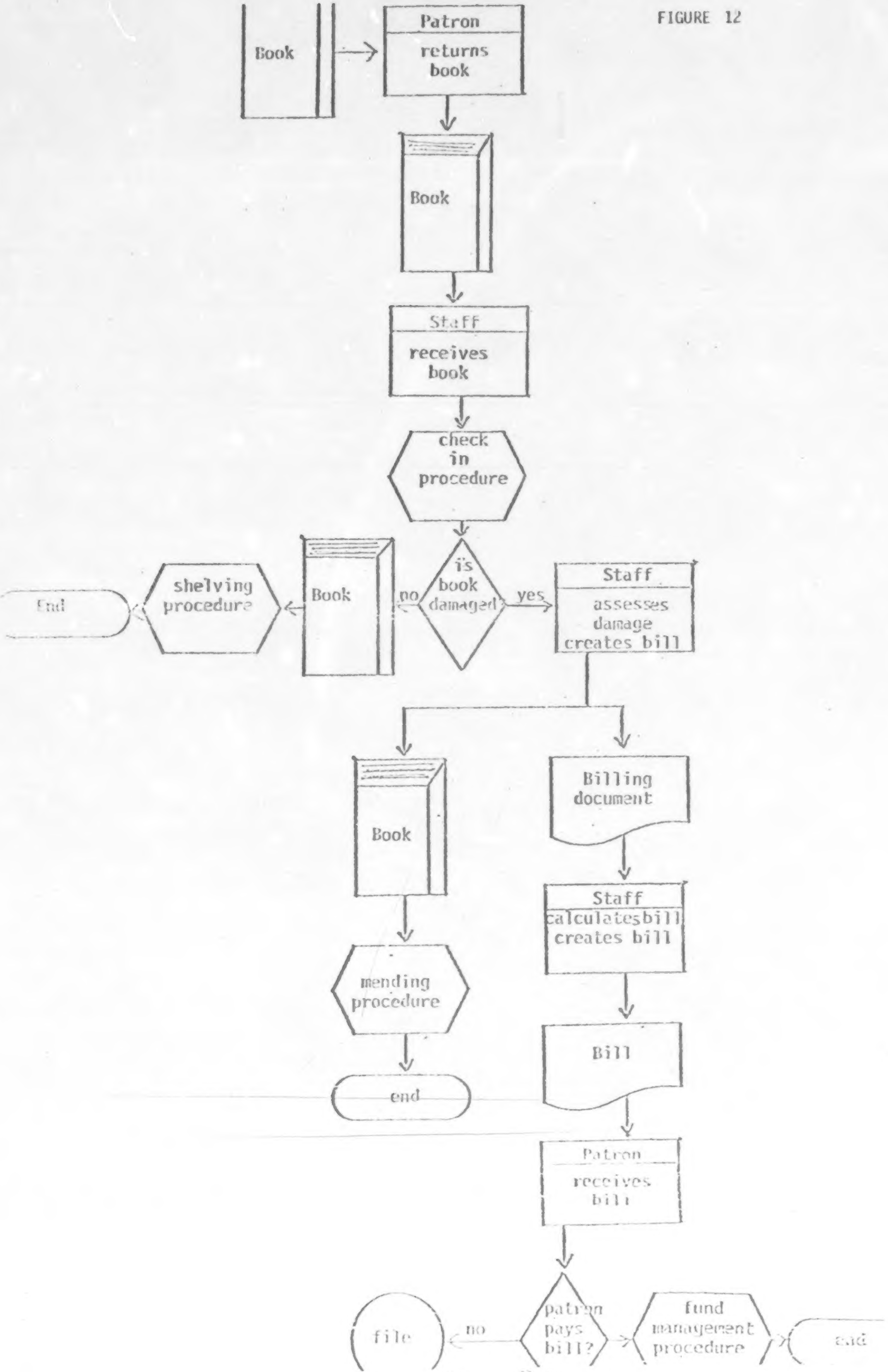
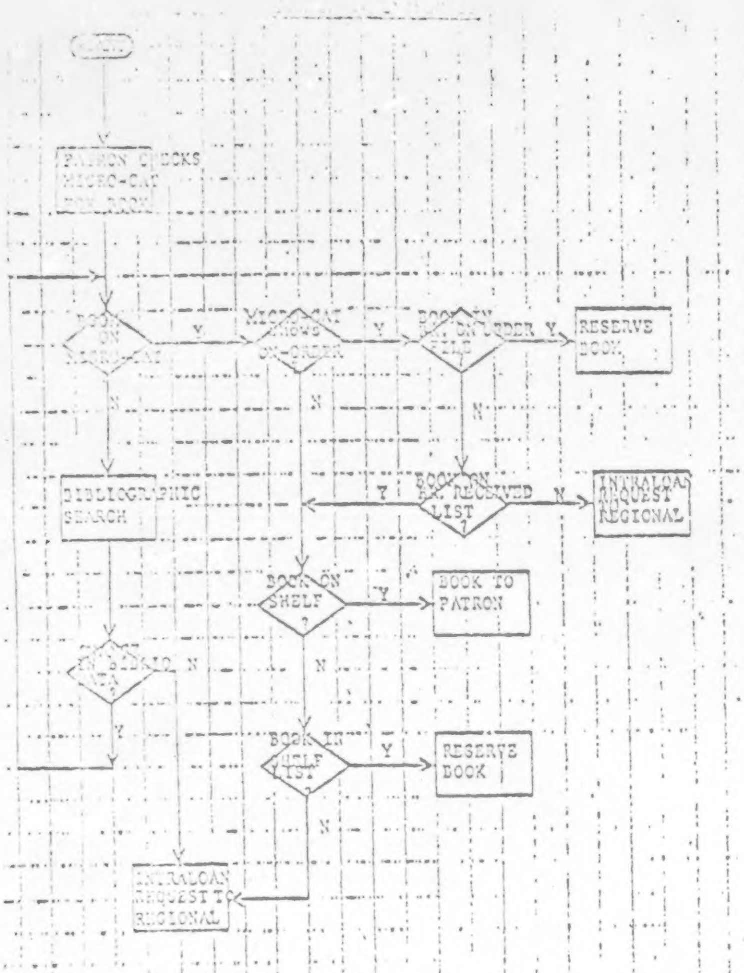

Patron
Charge slip
Patron
completes charge slip
Book
Charge slip
Book
patron completed charge slip
patron ID
staff
validates charge slip
inserts date due slip in book
validates patron ID
Date due slip
patron
Date due slip
validated charge slip
Book
File

FIGURE 12


Book
Patron
returns book
Book
Staff
receives book
check in procedure
is book damaged?
no
yes
Book
shelving procedure
End
Staff
assesses damage creates bill
Book
mending procedure
end
Billing document
Staff
calculates bill creates bill
Bill
Patron
receives bill
patron pays bill?
no
file
fund management procedure
end


START
PATRON CHECKS MICRO-CAT FOR BOOK
BOOK ON MICRO-CAT
Y
N
MICRO-CAT shows ON-ORDER
BOOK IN ON ORDER FILE
RESERVE BOOK
BIBLIOGRAPHIC SEARCH
BOOK ON RECEIVED LIST ?
INTRALOAN REQUEST TO REGIONAL
BOOK ON SHELF ?
BOOK TO PATRON
BOOK IN SHELF LIST
RESERVE BOOK
INTRALOAN REQUEST TO REGIONAL

NOTES:

1. These flow diagrams show the basic book intra-library loan procedures for community, regional and the Hawaii State Library (main branch).
2. Certain aspects of these procedures are currently under review, and are subject to change. Additionally, these procedures are affected as new products are generated by the automated system.
3. The communication between libraries indicated is accomplished in one of three ways: 1) by standard intraloan form; 2) by teletype; or 3) by telephone.

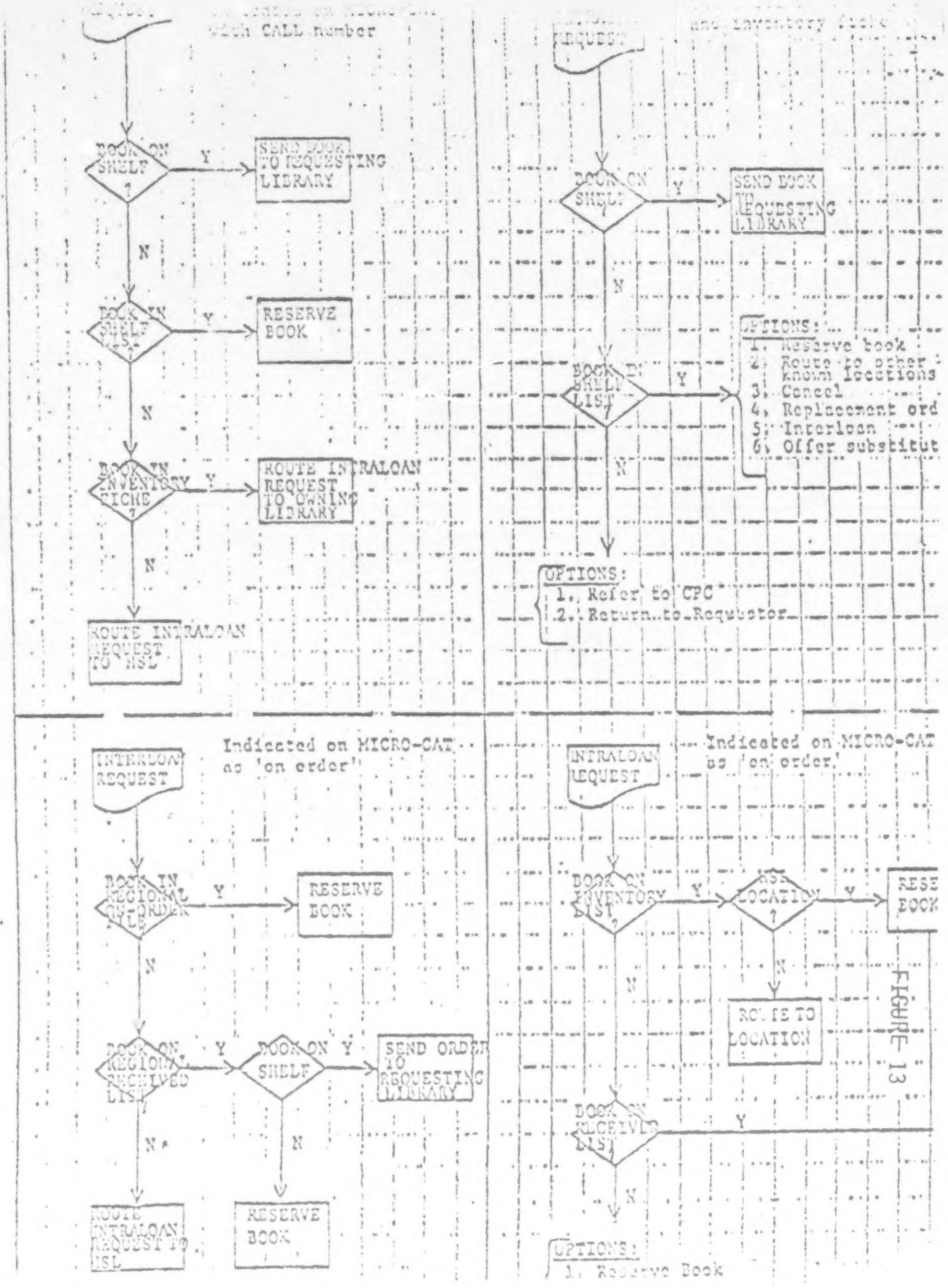
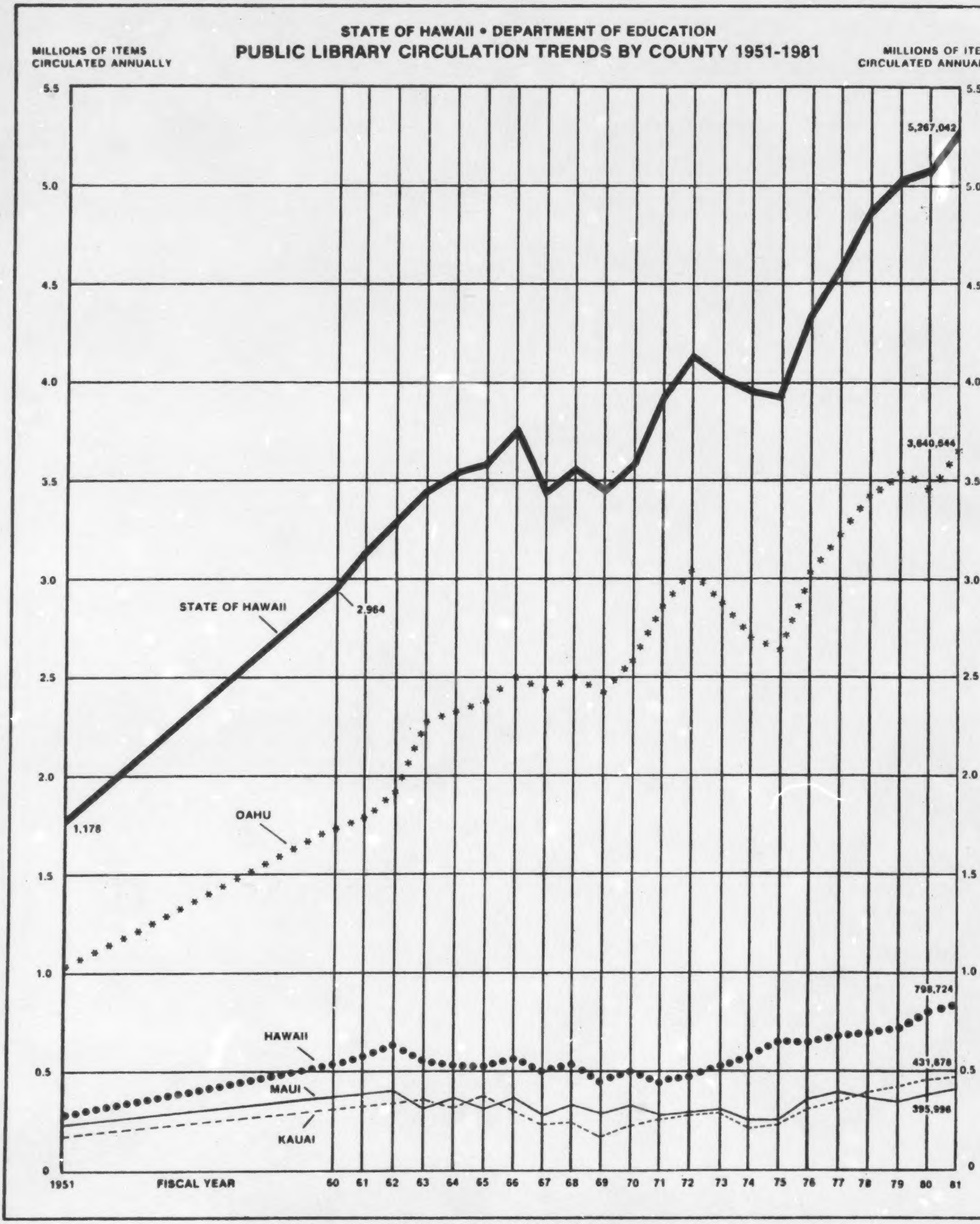

REQUEST
with CALL number
BOOK ON SHELF ?
Y
N
SEND BOOK TO REQUESTING LIBRARY
BOOK IN SHELF LIST
RESERVE BOOK
BOOK IN INVENTORY FICHE ?
ROUTE INTRALOAN REQUEST TO OWNING LIBRARY
ROUTE INTRALOAN REQUEST TO HSL
REQUEST
and inventory fiche
BOOK ON SHELF ?
SEND BOOK TO REQUESTING LIBRARY
BOOK IN SHELF LIST ?
OPTIONS:
1. Reserve book
2. Route to other known locations
3. Cancel
4. Replacement ord
5. Interloan
6. Offer substitut
OPTIONS:
1. Refer to CPC
2. Return to Requestor
INTERLOAN REQUEST
Indicated on MICRO-CAT as 'on order'
BOOK IN REGIONAL ON-ORDER FILE
RESERVE BOOK
BOOK ON REGIONAL RECEIVED LIST
BOOK ON SHELF
SEND ORDER TO REQUESTING LIBRARY
ROUTE INTRALOAN REQUEST TO HSL
RESERVE BOOK
INTRALOAN REQUEST
Indicated on MICRO-CAT as 'on order'
BOOK ON INVENTORY LIST ?
HSL LOCATION ?
RESE BOOK
ROUTE TO LOCATION
BOOK ON RECEIVED LIST
OPTIONS:
1. Reserve Book

FIGURE 13

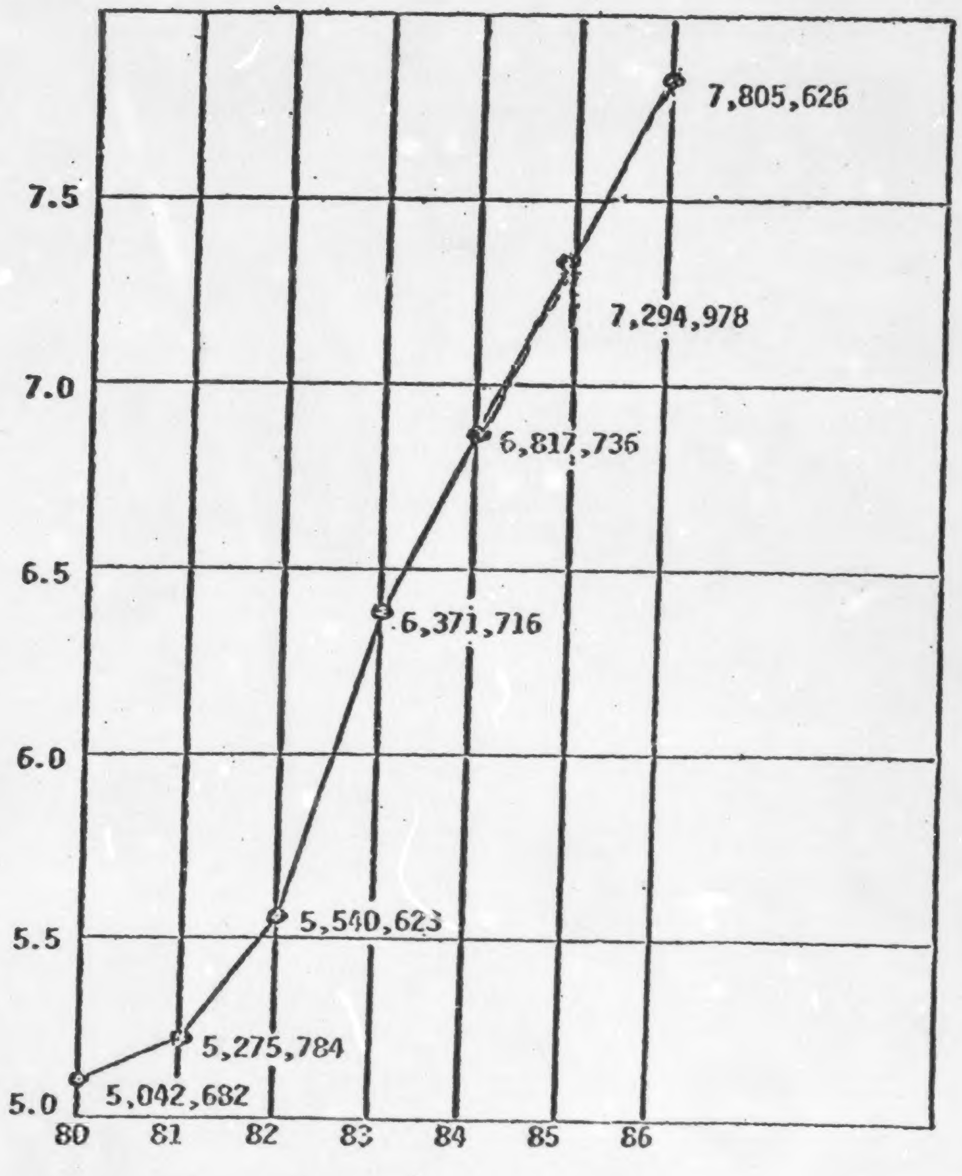
FIGURE 14

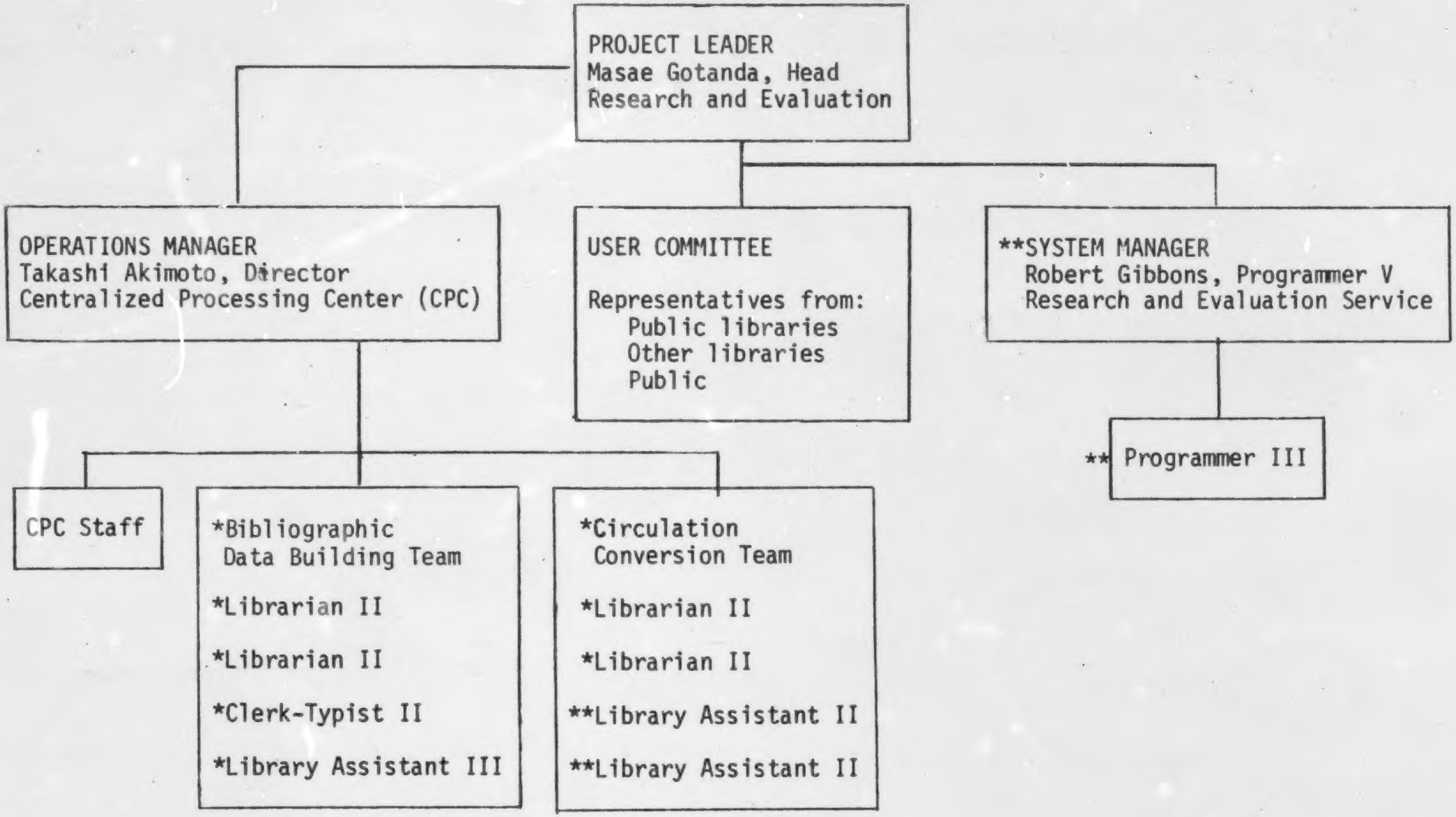

STATE OF HAWAII • DEPARTMENT OF EDUCATION

PUBLIC LIBRARY CIRCULATION TRENDS BY COUNTY 1951-1981

SOURCE: State of Hawaii, Department of Education, Office of Library Services Annual Reports
Booz, Allen & Hamilton, Inc.
Updated by Research & Evaluation Services Section, Office of Library Services

FIGURE 15


7,805,626
7.5
7,294,978
7.0
6,817,736
6.5
6,371,716
6.0
5,540,623
5.5
5,275,784
5.0
5,042,682
80
81
82
83
84
85
86


PROJECT LEADER
Masae Gotanda, Head
Research and Evaluation
OPERATIONS MANAGER
Takashi Akimoto, Director
Centralized Processing Center (CPC)
USER COMMITTEE
Representatives from:
Public libraries
Other libraries
Public
**SYSTEM MANAGER
Robert Gibbons, Programmer V
Research and Evaluation Service
** Programmer III
CPC Staff
*Bibliographic Data Building Team
*Librarian II
*Librarian II
*Clerk-Typist II
*Library Assistant III
*Circulation Conversion Team
*Librarian II
*Librarian II
**Library Assistant II
**Library Assistant II

* Federally-funded
** Federally-funded, to be converted to state funds

FIGURE 16

COMPUTER SITE

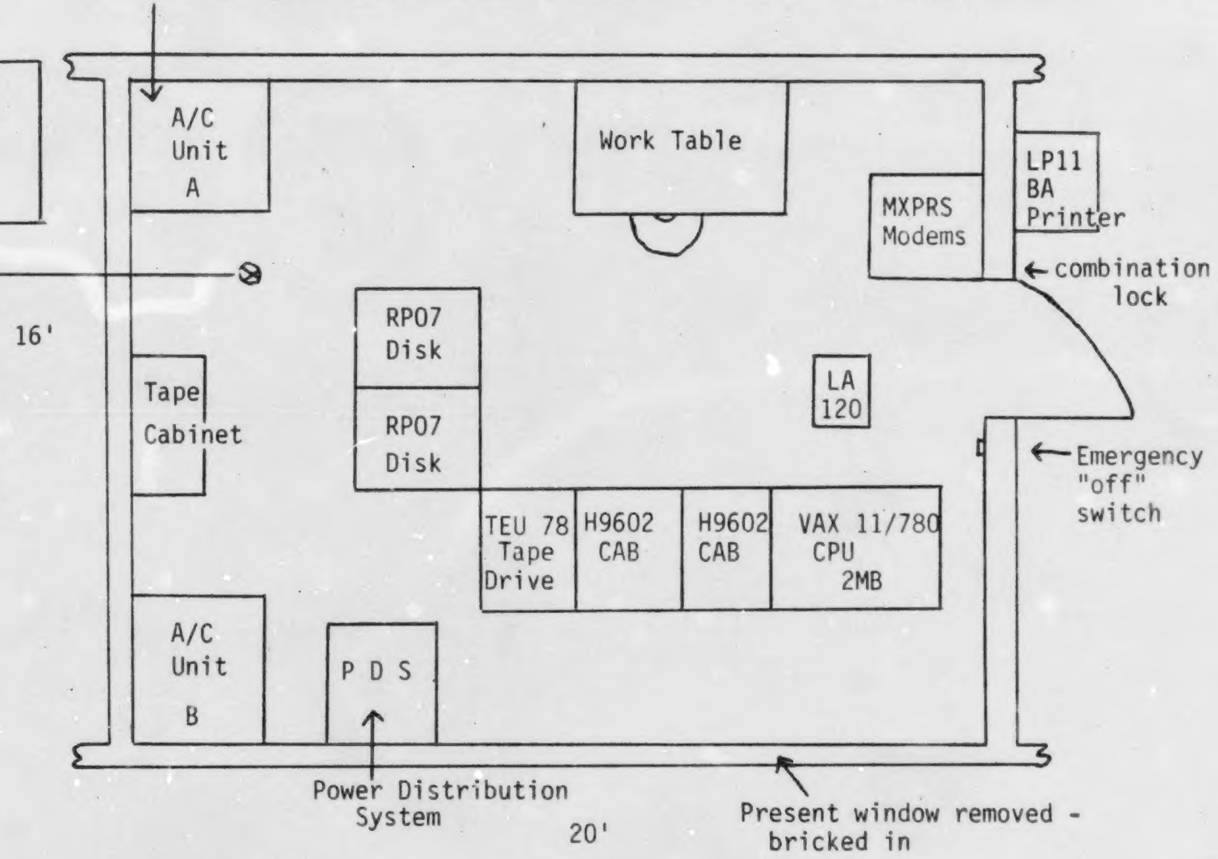
690 Pohukaina Street
Present Conference Room

FINAL RECOMMENDED LAYOUT.

JUNE 10, 1982

J. A. Speight
Universal Library Systems

Recommend 2 - 5 ton units - "cross wired" Total = 10 tons


A/C Unit A
Work Table
LP11 BA Printer
MXPRS Modems
combination lock
Carpeting removed - replaced with vinyl asbestos tile
16'
RP07 Disk
RP07 Disk
Tape Cabinet
LA 120
Emergency "off" switch
TEU 78 Tape Drive
H9602 CAB
H9602 CAB
VAX 11/780 CPU 2MB
A/C Unit B
P D S
Power Distribution System
20'
Present window removed - bricked in

ITEMS:

1. Harlon gas, hand held fire extinguisher.
2. Smoke detector.
3. Temperature/humidity recorder.
4. Telephone line for Digital Remote Diagnostics.
5. Telephone lines (2) for Dial in Modems.
6. Ground to real ground
7. Varistors?

FIGURE 17

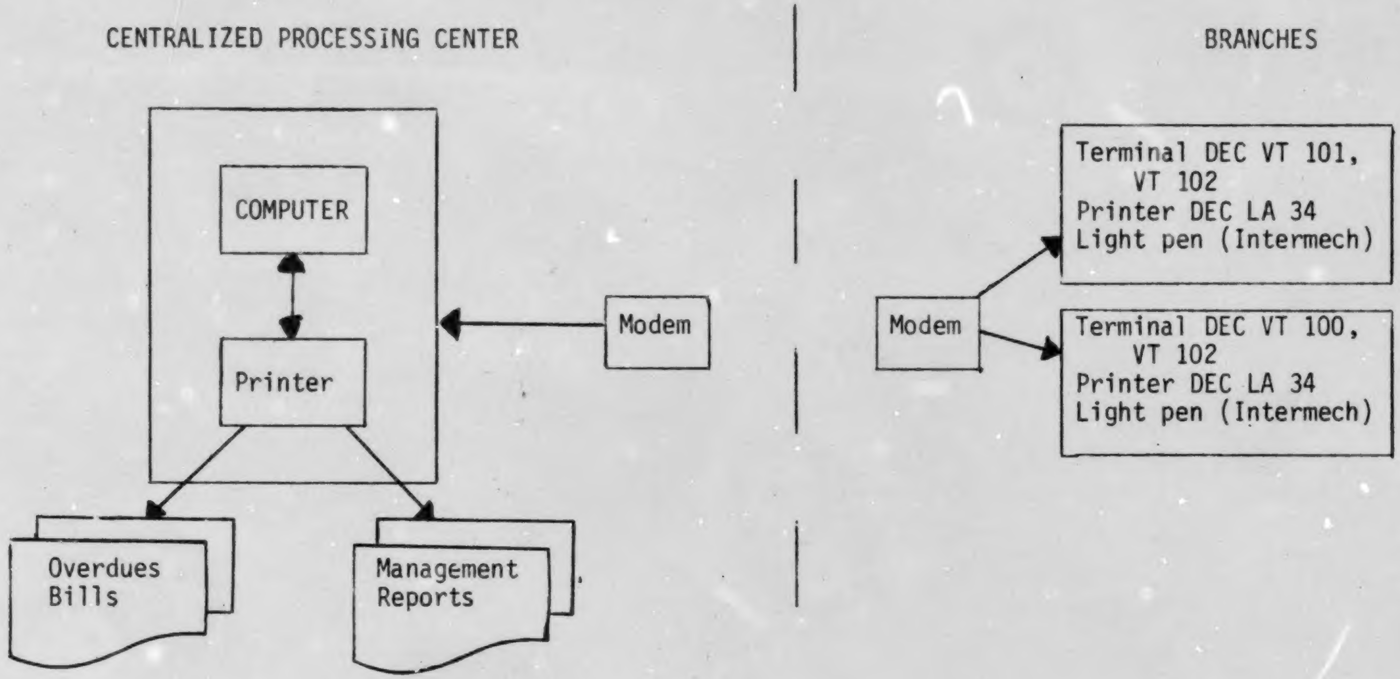

CENTRALIZED PROCESSING CENTER
COMPUTER
Printer
Modem
Overdues Bills
Management Reports
BRANCHES
Modem
Terminal DEC VT 101, VT 102
Printer DEC LA 34
Light pen (Intermech)
Terminal DEC VT 100, VT 102
Printer DEC LA 34
Light pen (Intermech)

FIGURE 18

FIGURE 19

PHASE I 1982/83

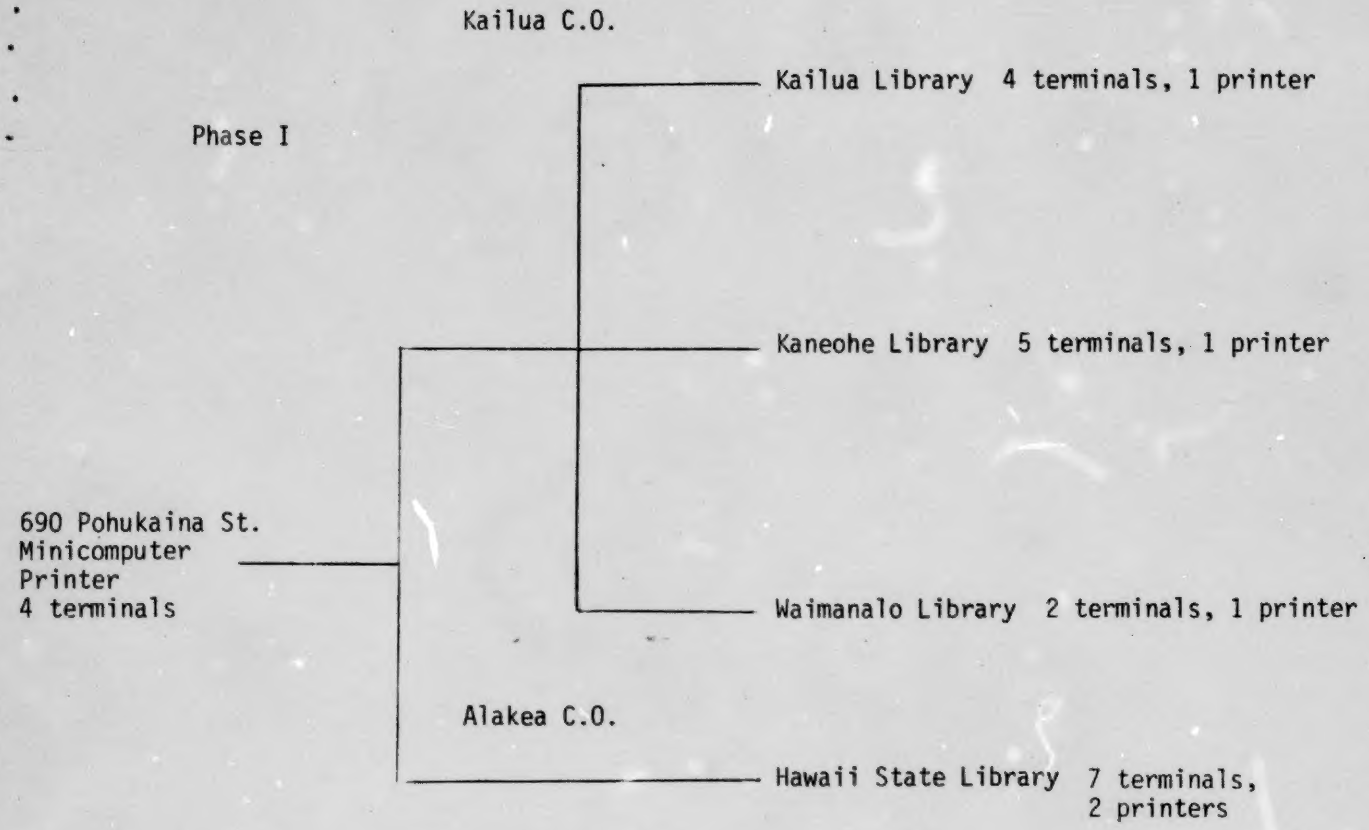

Kailua C.O.
Phase I
Kailua Library 4 terminals, 1 printer
Kaneohe Library 5 terminals, 1 printer
690 Pohukaina St.
Minicomputer
Printer
4 terminals
Waimanalo Library 2 terminals, 1 printer
Alakea C.O.
Hawaii State Library 7 terminals, 2 printers

FIGURE 20

PHASE II

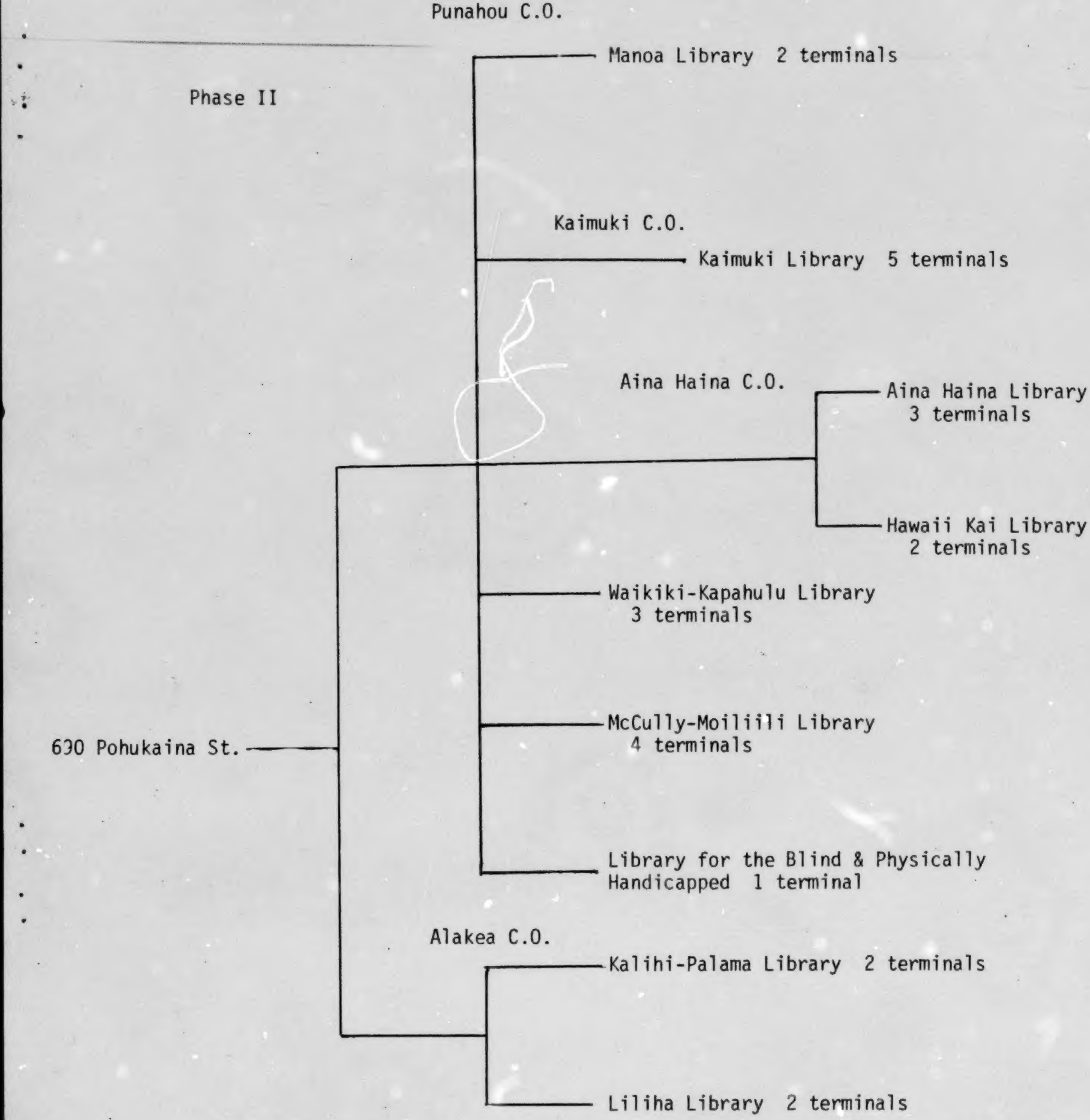
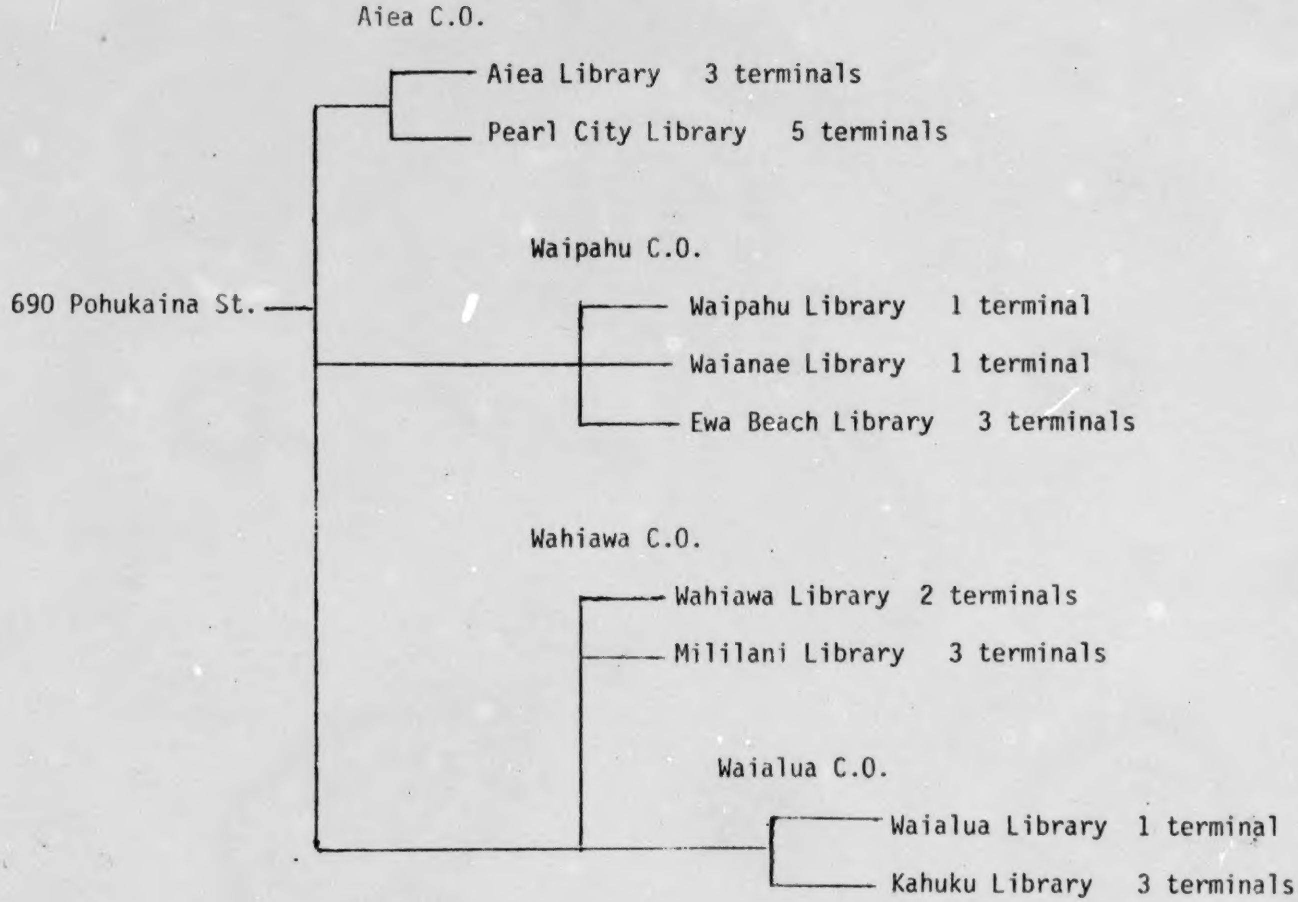

Punahou C.O.
Manoa Library 2 terminals
Phase II
Kaimuki C.O.
Kaimuki Library 5 terminals
Aina Haina C.O.
Aina Haina Library 3 terminals
Hawaii Kai Library 2 terminals
Waikiki-Kapahulu Library 3 terminals
630 Pohukaina St.
McCully-Moiliili Library 4 terminals
Library for the Blind & Physically Handicapped 1 terminal
Alakea C.O.
Kalihi-Palama Library 2 terminals
Liliha Library 2 terminals

FIGURE 20 a

PHASE II WEST OAHU


Aiea C.O.
Aiea Library 3 terminals
Pearl City Library 5 terminals
Waipahu C.O.
690 Pohukaina St.
Waipahu Library 1 terminal
Waianae Library 1 terminal
Ewa Beach Library 3 terminals
Wahiawa C.O.
Wahiawa Library 2 terminals
Mililani Library 3 terminals
Waialua C.O.
Waialua Library 1 terminal
Kahuku Library 3 terminals

Total terminals: 22

PHASE III 1984/1985

HAWAII
MULTI-POINT NETWORK

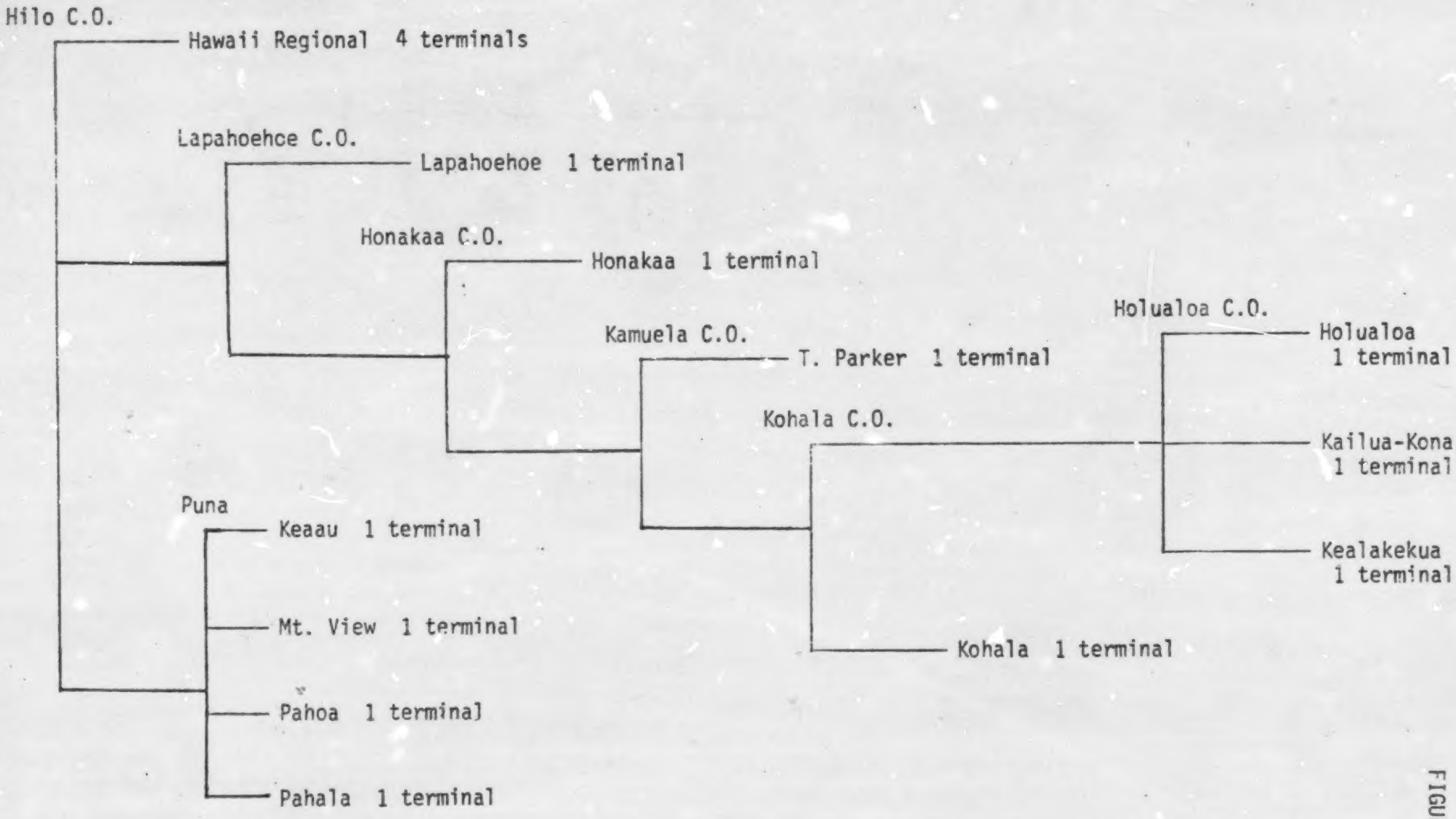

Hilo C.O.
Hawaii Regional 4 terminals
Lapahoehce C.O.
Lapahoehoe 1 terminal
Honakaa C.O.
Honakaa 1 terminal
Kamuela C.O.
T. Parker 1 terminal
Holualoa C.O.
Holualoa 1 terminal
Kohala C.O.
Kailua-Kona 1 terminal
Kealakekua 1 terminal
Kohala 1 terminal
Puna
Keaau 1 terminal
Mt. View 1 terminal
Pahoa 1 terminal
Pahala 1 terminal

FIGURE 21

Total terminals: 33

PHASE III 1984/1985

MAUI
MULTI-POINT NETWORK

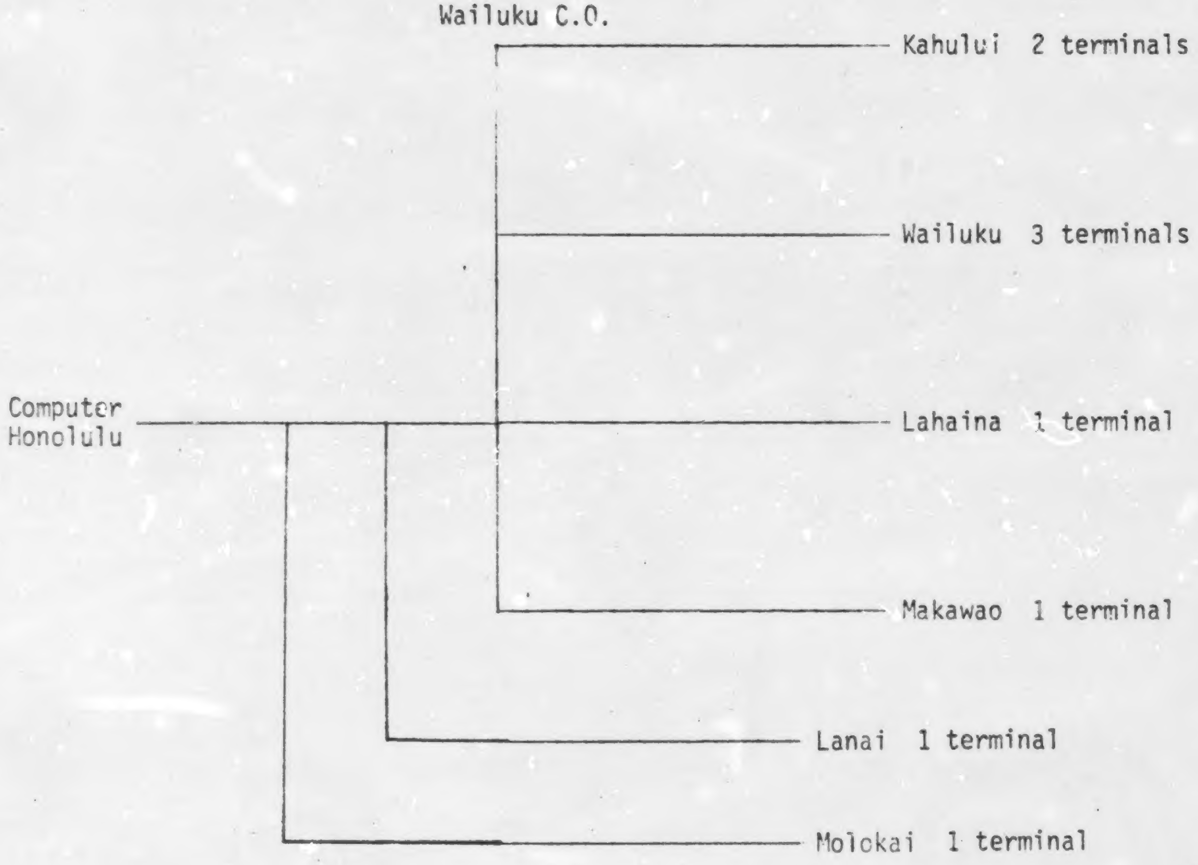

Wailuku C.O.
Kahului 2 terminals
Wailuku 3 terminals
Computer Honolulu
Lahaina 1 terminal
Makawao 1 terminal
Lanai 1 terminal
Molokai 1 terminal

FIGURE 22

PHASE III 1984/1985

KAUAI
MULTI-POINT NETWORK

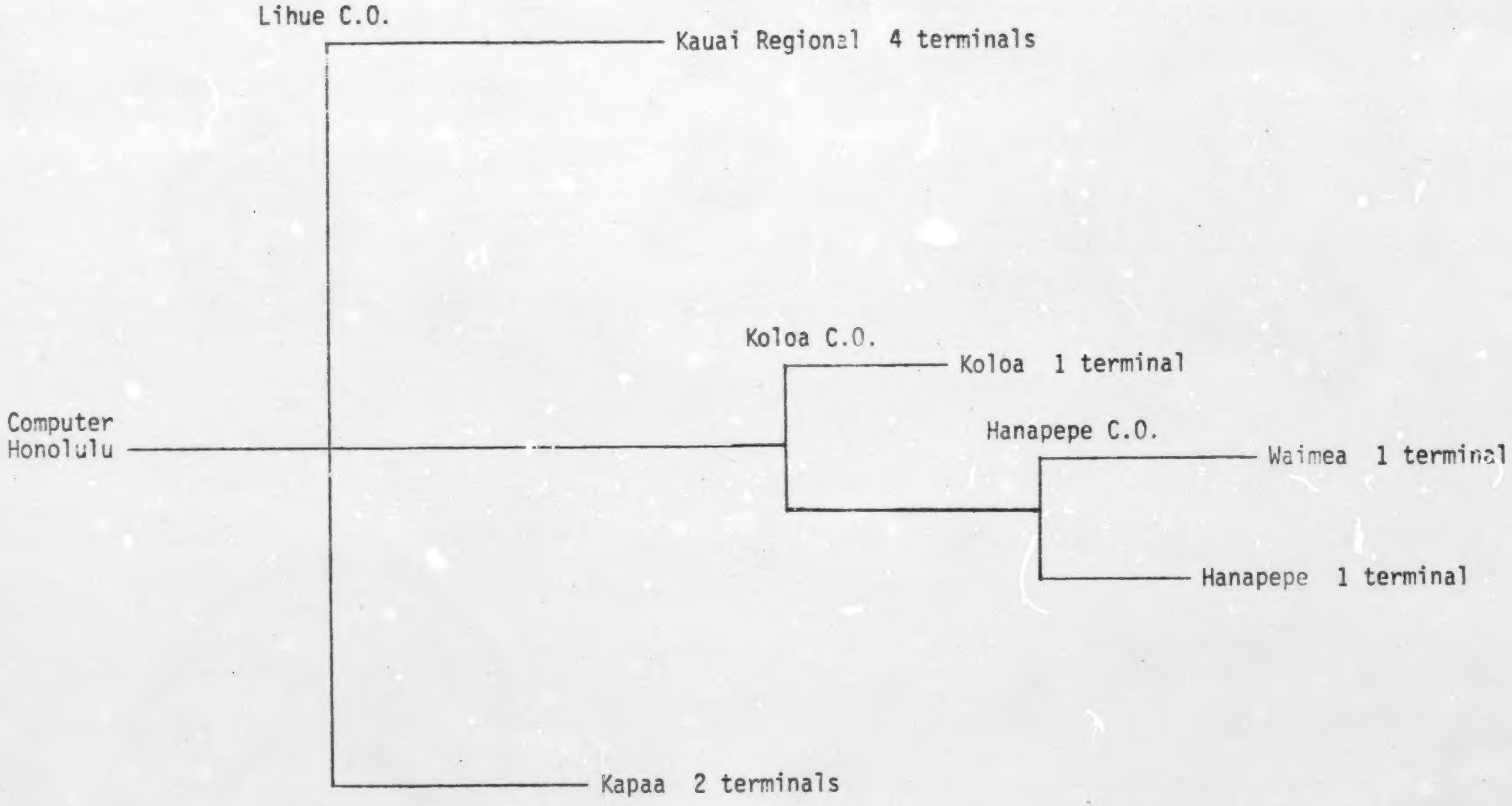

Lihue C.O.
Kauai Regional 4 terminals
Koloa C.O.
Koloa 1 terminal
Hanapepe C.O.
Waimea 1 terminal
Computer
Honolulu
Hanapepe 1 terminal
Kapaa 2 terminals

FIGURE 23

AUTOMATION SYSTEMS INTERFACES

Department of Education
Office of Library Services
Centralized Processing Center (CPC)

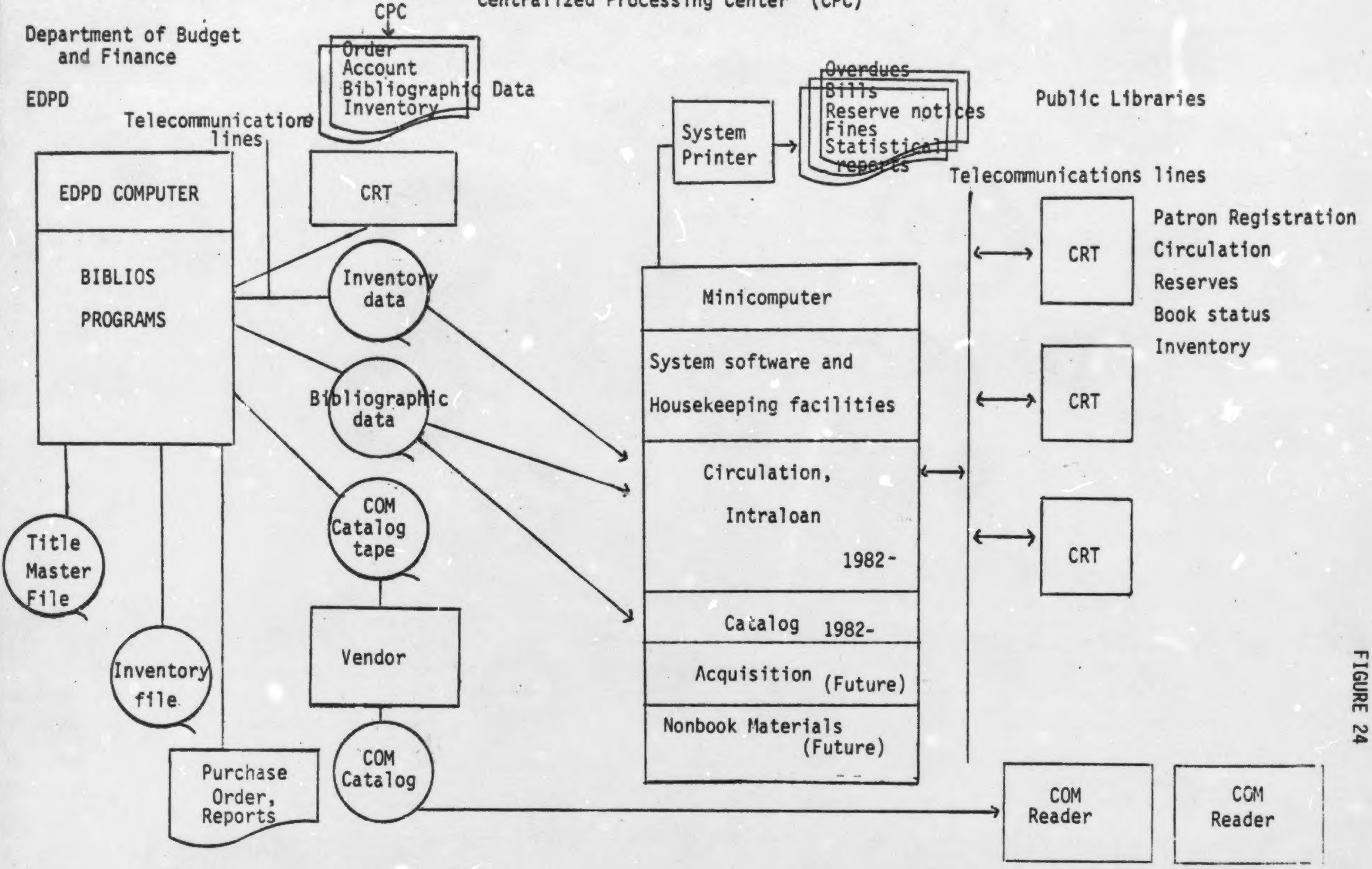

CPC
Department of Budget and Finance
EDPD
Order
Account
Bibliographic Data
Inventory
Telecommunications lines
EDPD COMPUTER
BIBLIOS PROGRAMS
CRT
Inventory data
Bibliographic data
COM Catalog tape
Title Master File
Inventory file
Purchase Order, Reports
Vendor
COM Catalog
System Printer
Overdues
Bills
Reserve notices
Fines
Statistical reports
Minicomputer
System software and Housekeeping facilities
Circulation, Intraloan 1982-
Catalog 1982-
Acquisition (Future)
Nonbook Materials (Future)
Public Libraries
Telecommunications lines
CRT
CRT
CRT
Patron Registration
Circulation
Reserves
Book status
Inventory
COM Reader
COM Reader

FIGURE 24

INSTALLATION SCHEDULE FOR PHASE I

TASK	1982 Jly	Aug	Sept	Oct	Nov	Dec	1983 Jan	Feb	Mar	Apr	May	Je	Jly	Aug	Sept	Oct	Nov	Dec
Contract																		
Computer Site		Aug 1-Sept 30																
Computer Installation				Oct														
Terminals																		
CPC					Nov													
Software tests					Nov													
Kaneohe						Dec												
Closed for conversion						Dec 13-Jan 14 (Opening Jan 15)												
Kailua						Dec												
Closed for conversion							Jan 24-Feb 19 (Opening Feb 21)											
Waimanalo									Mar									
Installation and conversion									Mar 1-31									
Closed for conversion									Mar 21-26 (Opening Apr 1)									
Hawaii State Library																		
Installation and conversion							Jan 1-Aug 31 (Circulation system installed Sept 1)											
Hawaii, Maui, Kauai, Univ. of Hawaii										Apr 1-Je 1 (For inquiry, intra and interloan, and indexing)								
Acceptance tests												Je 1-Dec 31						
Final payment and acceptance																		Dec

FIGURE 25

AUTOMATION SYSTEMS INTERFACES

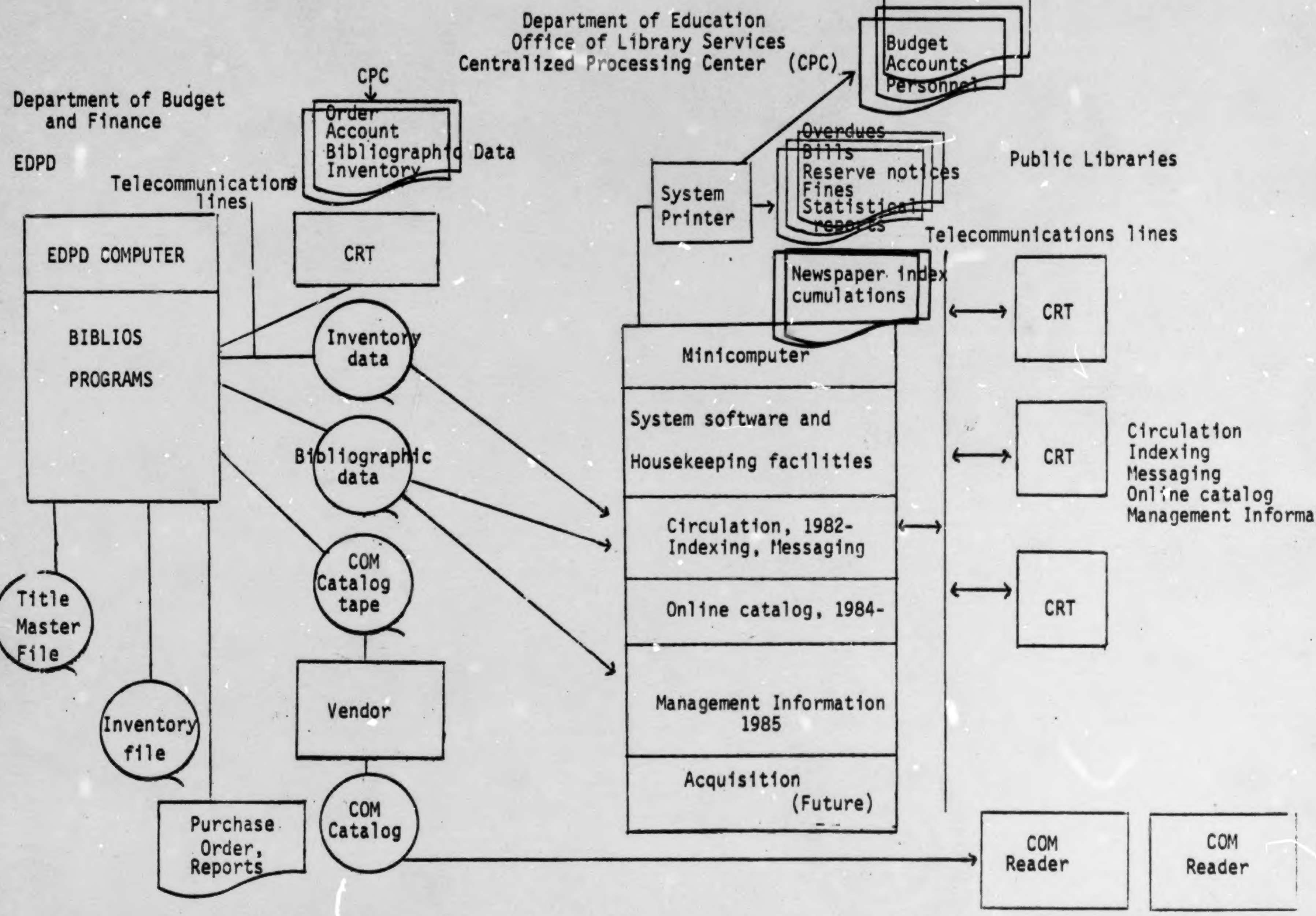

Department of Education
Office of Library Services
Centralized Processing Center (CPC)
Budget
Accounts
Personnel
Department of Budget and Finance
EDPD
CPC
Order
Account
Bibliographic Data
Inventory
Telecommunications lines
CRT
EDPD COMPUTER
BIBLIOS
PROGRAMS
Inventory data
Bibliographic data
COM Catalog tape
Vendor
COM Catalog
Title Master File
Inventory file
Purchase Order, Reports
System Printer
Overdues
Bills
Reserve notices
Fines
Statistical reports
Newspaper index cumulations
Minicomputer
System software and
Housekeeping facilities
Circulation, 1982-
Indexing, Messaging
Online catalog, 1984-
Management Information
1985
Acquisition
(Future)
Public Libraries
Telecommunications lines
CRT
CRT
CRT
Circulation
Indexing
Messaging
Online catalog
Management Informatio
COM Reader
COM Reader

FIGURE 26

FACILITIES CHART: HAWAII STATE LIBRARY SYSTEM

TABLE Ia

Library	Year Built	"Area" Population 1/	Site (Sq. Ft.)	Building Size (Sq. Ft.)	Shelf Capacity (Vols.)	Bookstock 6/30/81	Reading Rm. Seats		Authorized Staff 2/			Annual Book Circulation 6/30/81	Micro-films (reels) 6/30/81	Audio-visuals				Hours Open/Week As of 6/30/81	Mtg. Room Seats	Off Str. Prk. Stalls	Remarks
							Ad.	Juv.	Prof.	Clerk	Main			Cass Tapes	F/S	Loop	TV				
OAHU		963,617																			
Hawaii State Library	1929	942,300	86,519	57,379	212,000	377,304	200	48	29	44.1	7	418,414	11,805	2,749	398	—		54	—	—	Overcrowded; Parking desperate
LBPH	1961	66,685	114,400	11,788	66,175	77,176	10	—	3	10	1	33,545	—	920	211	683	Yes	50.5	—	14	
Aiea	1964	23,815	34,425	10,724	33,570	40,618	36	32	2	3	1	149,026	—	497	210	—	Yes	42	69	23	Carpeted; Temperature/humidity control
Aina Haina	1962	16,660	22,000	11,086	21,000	41,261	91	51	2	4	1	182,305	223	787	269	--	—	50	50	8	Carpeted; Temperature/humidity control
Ewa Beach Community Sch	1971	27,696	N/A	23,[illegible]0	55,000	62,411	132	62	4	9	2	110,701	1,728	2,072	534	—	Yes	45	110	45	Carpeted; Temperature/humidity control; Total media
Hawaii-Kai	1973	25,603	19,607	13,437	33,000	62,580	115	24	2	3	2	133,552	1,393	1,282	569	324	Yes	49	110	25	Carpeted; Temperature/humidity control; CATV
Kahuku Community Sch	1968	14,395	N/A	8,464	29,500	47,819	52	22	1	3	3	67,083	2,474	1,075	2,614	77	Yes	56	54	12	Carpeted; Temperature/humidity control; Total media
Kailua	1960	41,291	44,073	11,500	28,600	51,933	150	53	2	4	1	255,172	1,484	610	248	—	Yes	52	74	20	In need of more parking stalls
Kaimuki Regional	1965	49,621	43,627	19,590	49,500	114,081	117	53	4	6	1.5	294,863	3,345	1,229	178	89	Yes	55	183	34	Temperature/humidity control and remodeling needed
Kalihi-Palama	1949	61,690	25,742	12,716	32,408	43,412	72	50	3	3	1	164,349	—	1,000	486	92	Yes	51	138	32	Carpeted; Temperature/humidity control
Kaneohe Regional	1963	58,950	40,000	11,207	41,288	87,321	78	44	5	6	2	303,433	2,874	882	425	169	—	54	84	37	Carpeted; Temperature/humidity control, Parking desperate

1/ 1981 State of Hawaii Data Book
2/ Full-time equivalents, excluding Student Helpers & exempt Hires; Maintenance: Janitors, Guards

Rev 2/82

FACILITIES CHART: HAWAII STATE LIBRARY SYSTEM

TABLE Ib

Library	Year Built	"Area" Population 1/	Site (Sq. Ft.)	Building Size (Sq. Ft.)	Shelf Capacity (Vols.)	Bookstock 6/30/81	Reading Rm. Seats		Authorized Staff 2/			Annual Book Circulation 6/30/81	Micro-films (reels) 6/30/81	Audio-visuals				Hours Open/Week As of 6/30/81	Mtg. Room Seats	Off Str. Prk. Stalls	Remarks
							Ad.	Juv.	Prof.	Clerk	Main			Cass Tapes	F/S	Loop	TV				
Liliha	1966	31,925	30,213	13,900	32,000	39,486	95	44	2	3	1	151,055	—	524	592	126	No	48	75	29	Carpeted; Temperature/ humidity control
McCully-Moiliili	1969	51,652	27,970	16,552 2-story	40,500	77,212	117	58	3	5	2	203,311	2,232	1,287	595	—	Yes	54	174	40	Part. carpeting; Temperature/ humidity cntrol
Manoa	1966	34,074	25,830	6,532	13,800	41,688	41	28	2	3	.5	165,243	—	911	148	—	No	44	75	19	Mtg. room carpeted; Temperature/ humidity control
Mililani	—	24,000	—	200	7,000	9,871	20	10	—	1	—	17,708	—	—	—	—	—	15	N/A	—	Housed at Mililani School Library
Pearl City Regional	1969	54,465	56,200	15,965	69,200	106,196	81	52	4	6	2	291,542	2,707	936	491	97	Yes	50	13	34	Carpeted; Temperature/ humidity control
Wahiawa	1965	41,562	36,250	10,450	25,000	33,016	66	30	2	3	1	133,259	—	624	64	—		46	85	21	Temperature/ humidity control
Waialua	1952	14,340	8,909	3,512	13,500	23,245	20	24	—	2	.5	68,485	—	443	63	—		36	N/A	3	Temperature/ humidity control 840 sq. ft. expansion
Waianae	1966	17,775	47,171	10,246	25,000	39,451	56	34	2	3	1	90,503	368	700	339	55	Yes	43	128	23	Temperature/ humidity control
Waikiki-Kapahulu	1952	33,620	14,388	10,963	18,500	40,091	44	32	2	3	1.5	186,299	—	361	206	—	No	48	197	30	Noise and dust problem. Need temperature/ humidity control
Waimanalo	1978	9,132	N/A	8,610	30,420	24,253	49	41	2	2	3	40,149	—	467	109	—	Yes	50	75	34	Carpeted; Temperature/ humidity control; Total media
Waipahu	1952	33,517	46,576	9,000	31,500	31,100	35	20	2	3	1	83,790	—	1,071	195	—	Yes	41	100	20	Poor location
Bookmobiles: **Pearl City** **Kaneohe**	 1981 1981	 Dodge Chassis Dodge Chassis		 126 126	 2,500 2,500	 — —	 — —	 — —	 — —	 — —	 — —	 13,389 29,370	 — —	 — —	 — —	 — —	 — —	 24 stops 24 stops	 — —	 — —	

1/ 1981 State of Hawaii Data Book
2/ Full-time equivalents excluding Student Helpers & exempt Hires: Maintenance, Janitors, Guards

FACILITIES CHART: HAWAII STATE LIBRARY SYSTEM

TABLE Ic

Library	Year Built	"Arca" Population	Site (Sq. Ft.)	Building Size (Sq. Ft.)	Shelf Capacity (Vols.)	Bookstock 6/30/81	Reading Rm. Seats		Authorized Staff 2/			Annual Book Circulation 6/30/81	Micro films (reels) 6/30/81	Audio-visuals				Hours Open/ Week As of 6/30/81	Mtg. Room Seats	Off Str. Prk. Stalls	Remarks
							Ad.	Juv.	Prof.	Clerk	Main			Cass Tapes	F/S	Loop	TV				
HAWAII		63,468																			
Hawaii (Hilo) Regional	1951	42,278	82,645	28,940 2-story	135,740	138,966	146	38	5	7	3	342,979	4,343	1,406	1,044	—	Yes	60	N/A	60	
Holualoa	1951	1,242	5,810	640	3,000	3,099	11	10	—	.5	—	5,901	—	26	—	—		20	N/A	2	Temperature/ humidity control
Honokaa	1935	5,128	10,800	1,880	·7,544	9,864	50	20	—	2	.17	36,933	—	93	—	—		40	N/A	3	
Kailua-Kona	—	12,506	—	920	6,000	10,537	15	10	—	2	—	49,903	—	113	—	—		40	N/A	2	Temperature/ humidity control
Keaau Community Sch	1973	5,590	N/A	5,600	10,000	11,294	34	16	1	3	.5	36,802	—	60	—	—	Yes	55	50	0	Carpetod; Temperature/ humidity control; Total media
Kealakekua	1951	5,914	10,833	3,229	10,950	15,314	21	20	—	2	.5	59,733	—	105	—	—		40	N/A	7	Carpeted; Temperature/ humidity control
Bond Memorial (Kohala)	1927	3,249	10,783	1,610	5,872	8,557	21	12	—	2	.13	34,755	—	78	—	—		40	N/A	0	Some parking available at adjacent market
Laupahoehoe Community Sch	1972	1,679	N/A	8,000	15,000	15,596	76	32	1	4	.5	34,310	—	92	104	76	Yes	55	50	23	Carpeted; Temperature/ humidity control; Total media
Mt. View	1976	1,465	N/A	2,992	6,750	6,708	—	—	1	2	.5	19,133	—	59	—	—	Yes	55	50	8	Carpeted; Temperature/ humidity control; Total media
Naalehu	Rental	1,161	—	95	625	—	4	8	—	—	—	5,805	—	—	—	—		8	N/A	0	Operated as sub branch of Pahala C/S Library
Pahala Community Sch	1963	2,538	8,400	4,000	7,192	14,230	36	34	—	2	.5	22,615	—	69	—	—		51	N/A	9	

1/ 1981 State of Hawaii Data Book
2/ Full-time equivalents, excluding Student Helpers & exempt Hires; Maintenance; Janitors, Guards

FACILITIES CHART: HAWAII STATE LIBRARY SYSTEM

TABLE Id

Library	Year Built	"Area" Population 1/	Site (Sq. Ft.)	Building Size (Sq. Ft.)	Shelf Capacity (Vols.)	Bookstock 6/30/81	Reading Rm. Seats		Authorized Staff 2/			Annual Book Circulation 6/30/81	Micro-films (reels) 6/30/81	Audio-visuals				Hours Open/ Week As of 6/30/81	Mtg. Room Seats	Off Str. Prk. Stalls	Remarks
							Ad.	Juv.	Prof.	Clerk	Main			Cass Tapes	F/S	Loop	TV				
Pahoa Community Sch	1966	4,696	8,000	4,539	12,480	15,725	35	35	—	2	.5	53,667	—	88	—	—		51	N/A	12	Partial carpeting
Parker Memorial (Waimea)	1978	4,607	—	9,380	27,300	19,769	23	8	1	3	.5	76,472	—	93	—	—	Yes	55	50	47	Carpeted; Temperature/ humidity control; Total media
Bookmobiles:																					
Hilo	1976	International Chassis		92	N/A	N/A	—	—	—	—	—	841	—	26	—	—	Yes	4 stops	—	—	Discontinued 7/30/81
Hamakua-Kohala	1971	International Chassis		78	1,000	—	—	—	—	—	—	460	—		—	—			—	—	
Kona	1976	International Chassis		92	1,500	—	—	—	—	2	—	19,000	—	—	—	—		—	—	—	Bookmobile replaced with Hilo Media mobile (1/81)
Extension						4,277								1,310	171	56		—	—	—	
KAUAI		39,117																			
Kauai (Lihue) Regional	1969	8,595	53,500	22,300	55,000	81,440	82	41	4	9	1.5	143,484	2,850	2,109	296	101	Yes	57	175	31	Carpeted; Temperature/ humidity control
Hanapepe	1950	4,135	39,204	3,641	11,800	18,206	47	34	—	2	1	44,448	—	484	26	—	Yes	40	N/A	10	Carpeted; Expansion planned
Kapaa	1955	13,181	43,560	4,948	11,750	18,929	35	25	—	2	.5	78,775	—	520	18	—	—	36	60	43	Temperature/ humidity control
Koloa Community Sch	1976	7,498	12,544	8,007	15,000	23,544	45	16	1	3	.5	61,955	—	466	130	55	Yes	52	56	24	Carpeted; Temperature/ humidity control; Total media link with CCTV
Waimea	1950	5,708	26,134	3,724	9,800	17,338	40	8	—	2	.5	47,585	50	374	10	—	Yes	40	50	11	Carpeted; Temperature/ humidity control
Bookmobile: Lihue	1980	Dodge Chassis		130	1,600	9,705	N/A	N/A	—	3	—	55,431	—	118	—	—	—	22 stops	—	—	

1/ 1981 State of Hawaii Data Book

2/ Full-time equivalents, excluding Student Helpers & exempt Hires; Maintenance: Janitors, Guards

FACILITIES CHART: HAWAII STATE LIBRARY SYSTEM

TABLE Ie

Library	Year Built	"Area" Population 1/	Site (Sq. Ft.)	Building Size (Sq. Ft.)	Shelf Capacity (Vols.)	Bookstock 6/30/81	Reading Rm. Seats		Authorized Staff 2/			Annual Book Circulation 6/30/81	Micro-films (reels) 6/30/81	Audio-visuals				Hours Open/ Week As of 6/30/81	Mtg. Room Seats	Off Str. Prk. Stalls	Remarks
							Ad.	Juv.	Prof.	Clerk	Main			Cass Tapes	F/S	Loop	TV				
MAUI		63,987																			
Maui (Wailuku) Regional	1929	16,993	22,086	10,075	55,500	65,831	41	32	2	4	1	95,863	241	778	109	38		46	N/A	0	Partially carpeted; Parking problem
Kahului	1962	25,756	66,556	11,862	44,460	51,877	49	26	3	6	1	107,964	3,271	623	90	—	Yes	46	200	30	Becoming Regional library. Need A/C badly
Lahaina	1955	10,284	19,031	4,908	8,800	14,224	20	28	1	1	1	28,956	—	—	—	—		40	50	7	Parking problem impossible
Lanai	1975	2,119	N/A	7,568	14,000	19,829	54	26	1	3	1	35,613	0	571	1,206	56	Yes	51	62	40	Carpeted; A/C Total media
Makawao	1969	9,079	26,696	5,632	13,420	17,312	42	28	1	2	.5	62,417	35	806	204	60		40	70	18	Carpeted; A/C
Molokai	1937	5,905	53,622	3,627	8,200	14,143	23	24	1	2	1	28,646	—	514	2	—	Yes	40	N/A	6	Carpeted; A/C
Hana		711	(Using old Hana School rooms)			4,094						1,892	—	—	—	—		18	—	—	
Bookmobiles: Wailuku	1977	International Harvester		150	2,000	—	N/A	2	1	1	—	29,025	—	—	—	—	Yes	34 stops	—	—	New vehicle; received 2/78 AV/TV media
Molokai	1972	Chevrolet Van		49	1,500	—	N/A	N/A	1	1	—	1,960	—	—	—	—		2 stops	—	—	Operated by Molokai Staff

1/ 1981 State of Hawaii Data Book
2/ Full-time equivalents, excluding Student Helpers & exempt Hires; Maintenance; Janitors, Guards

TABLE II

* Staff Hours and Staff Costs for First Notices, Bills and Lost and Withdraw

NOTICE	TOTAL NUMBER	TOTAL MANHOURS	COST/ITEM	TOTAL COST
First Notice	217,236	18,103	$.41	$ 89,791
Second Notice	110,253	18,376	$.99	$108,970
Lost and Withdrawn From Inventory	100,000	16,667	$.79	$ 79,168
TOTALS	427,489	53,146	$.65	$277,929

* Hours and costs based on 1979 figures.

From: Epstein, Hank: Automated Circulation System for the Hawaii State Library System, Feasibility Study - Phase II, October, 1980. P. 5

TABLE III	June 30 1972	June 30 1973	June 30 1974	June 30 1975	June 30 1976	June 30 1977	June 30 1978	June 30 1979	June 30 1980	June 30 *1981 (estimate based on first three-quarters)
Book funds encumbered at CPC	734,389	642,387	439,742	599,116	861,468	851,303	938,000	1,526,000	2,087,000	2,157,000
Circulation	4,012,982	3,933,295	3,974,000	4,122,552	4,424,364	4,597,284	4,860,029	5,004,477	5,042,682	5,275,944
First Notice	103,995	102,404	157,033	184,270	209,370	231,996	249,331	215,603	232,770	227,585
Second Notice	29,061	32,714	42,434	47,245	52,933	62,469	67,892	69,338	67,526	72,591
Lost & Withdrawn from Inventory	29,338	32,294	40,894	39,231	40,292	59,290	61,809	71,555	80,910	79,966
Average book cost	13.25	12.99	12.20	14.09	16.19	16.32	18.57	20.24	22.80	24.00
$ Value of loss at current value	388,729	419,499	498,907	552,765	652,327	967,612	1,147,793	1,448,273	1,844,748	1,919,184
$ Value with 30% book jobber's discount	272,111	293,650	349,235	386,936	456,629	677,329	803,455	1,013,791	1,291,324	1,343,429

TABLE IV

	annual expenditure ($000)	no. of libraries measured	summary measure	probability of ownership	probability of availability	"success scores"*
Hawaii State Library[1]	1,250	1	---	.120	.508	.061
P.L.A. Studies:[2] Phase I	250-750	3	average	.236	.684	.160
Phase II	750-3,500	24	median	.230	.720	.166
Illinois (Statewide)[3]	300 or more	28	average	.150	.690	.104
New Jersey[3]	"main" library	N.A.	median	.107	.629	.070

Note: In that the range of sized of Libraries in Illinois and New Jersey may include many libraries much smaller than Hawaii State Library, figures from these states are not directly comparable to Hawaii State Library data.

---

*Probability of ownership times probability of availability

[1] From library measurements conducted for this study

[2] From Ernest R. De Prospo, Ellen Altman, and Kenneth E. Beasley, Performance Measures for Public Libraries (Public Library Association, American Library Association, 1973)

[3] From unpublished studies made available by Dr. Ernest De Prospo

Table from Survey Marketing Services, Inc. Analysis of Service and Development of Performance Measurements for State of Hawaii Libraries

TABLE V

ALTERNATIVE I - $702,194

HAWAII - PHASE I - EAST OAHU (Based on ULISYS)

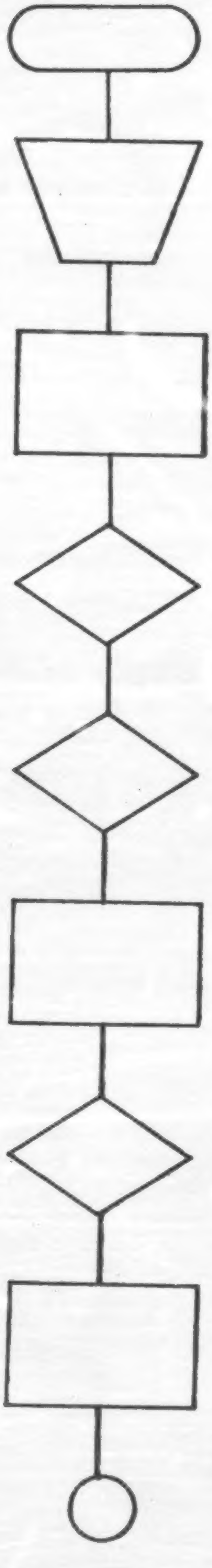
YEAR 1: Kaneohe, Kailua, Waimanalo Libraries, Hawaii State Library

	PURCHASE PRICE	BASIC ANNUAL MAINTENANCE
EQUIPMENT		
VAX 11/780	$325,000	$16,464
1 - RP07 disk drive	43,000	186
1 - DZ11-E 16 pos. multiplexors @ $4,350 ea.	4,350	636
1 - DD11-DK system unit backplane	900	
1 - 285 LPM printer	8,950	150
16 - VT100 terminals @ $1,615 ea.	25,840	200
16 - Xcables for VT100 @ $50 ea.	800	
8 - X9300 barcode reader @ $948 ea.	7,584	100
4 - X9400 portable barcode readers @ $1,940 ea.	7,760	60
2 - Xdial in modems @ $750 ea.	1,500	50
SUB-TOTAL	$425,684	$17,846
OTHER		
DQ095-AG VAX-11 Basic and Software fee	$ 59,200	
RSTS/E to VMS Upgrade	10,000	
30 day Installation & Warranty	15,000	
Labels	10,000	
Patron cards	10,000	
Site preparation	45,000	
Telecommunications		$21,111
Other (Electricity, Supplies)	25,000	
SUB-TOTAL	$174,200	
	$599,884	$38,957

(over)

HAWAII STATE LIBRARY

		PURCHASE PRICE	BASIC ANNUAL MAINTENANCE
EQUIPMENT			
7 - VT100 terminals @$1,615 ea.		$ 11,305	
1 - Xdial in modem		750	
7 - Xcables for VT100 @$50 ea.		350	
1 - X9300 barcode reader		948	
	SUB-TOTAL	$ 13,353	
OTHER			
Rennovations		$ 20,000	
Supplies		20,000	
Telecommunications			$ 10,000
	SUB-TOTAL	$ 40,000	$ 10,000
		$ 53,353	$ 10,000
	GRAND TOTAL	$702,194	



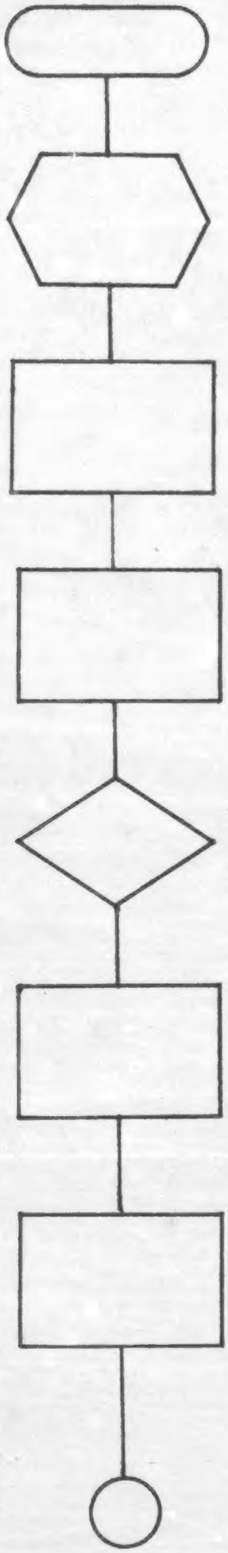
IR050337

HAWAII
DEPARTMENT OF EDUCATION
OFFICE OF LIBRARY SERVICES

PUBLIC LIBRARY AUTOMATION REPORT: CIRCULATION

APPENDIX

July, 1982



APPENDIX

IR050337

VT100 VIDEO TERMINAL

digital

The VT100, Digital's high performance video display terminal, offers a combination of features never before available on a compact, desk-top terminal. It is both affordable and easy to use, and has proved to be one of the most popular and imitated video terminals. The VT100 provides maximum video display flexibility, and the sculptured typewriter-like keyboard permits easy transition from typewriter to terminal. Operator-oriented features on the VT100, including double-width/double-size characters, 80 and 132 column lines, a detachable keyboard, smooth scrolling, a split screen, and composite video output, allow users to customize the video terminal to suit specific application needs.

HIGHLIGHTS

Operator-Oriented Features

- Sculptured typewriter-like detachable keyboard
- Standard numeric/function keypad
- Selectable double-width and double-size characters
- Up to 132 characters per line
- Bidirectional smooth scrolling
- Split screen capability
- Normal or reverse video on a character-by-character basis
- Optional blinking, underline, and bold characters
- Selectable black characters on a white screen or white characters on a black screen
- US and British character sets standard, others optional
- Settable tabs and line drawing graphic characters

Maintainability

- Exceptionally easy to service
- Built-in self-test diagnostics on power up

Engineering

- Communication speeds up to 19,200 baud
- Seven light-emitting diodes for operator information and diagnostic aids
- Non-volatile memory holds feature settings
- Full-duplex, asynchronous communication lines
- VT52 compatibility for easy upgrade
- Extra power, space, and internal interfaces for additional OEM hardware
- Composite video output for auxiliary monitors
- Composite video input for video overlay

DESCRIPTION

The VT100's operator-oriented features make it an ideal terminal for data capturing applications where operator efficiency is of prime importance. Only 20 inches deep, the VT100 is small enough to fit on a standard typewriter table. The sculptured, typewriter-like keyboard permits easy transition from typewriter to terminal. In addition to these features, the VT100's wide variety of user-controllable character and screen features also allows the user to customize the screen for specific application needs.

Normal and Reverse Video

Most video terminals provide white characters on a black background - normal video. The VT100 supports both normal and reverse video, allowing the user to choose black characters on a white background. Reverse video gives the screen the appearance of a page of printed text, making margins more visible and providing a different screen contrast and environment for the user. Normal and reverse video are also selectable on a character-by-character basis, enabling the user to emphasize portions of the text stream.

Readability

The VT100's 7x9 dot matrix character font provides crisp characters and two-dot descenders on lower-case characters. Double-width and double-size characters, selectable on a line-by-line basis, further enhance the readability of the screen. Large characters not only emphasize formatted text, but also make complicated forms easier to read. Using double-size characters, messages on the screen can even be read from across a room.

Graphic Characters
The basic character set features 32 line drawing graphic characters that can be used to present pictorial information on the screen. Line drawing capability includes solid-line displays of simple forms and data plotting in a format visually similar to hardcopy printouts.

Smooth Scrolling
The smooth scroll feature of the VT100 (in conjunction with the use of XON-XOFF transmission control) enables the user to read new lines of text easily, even if the transmission speed is high. The selectable, 132-column by 14-line format permits easy viewing of wide line printer reports, and allows these reports to be transferred directly from screen to printer without reformatting data.

Split Screen
The VT100's split screen capability allows portions of the 24-line screen to be scrolled separately. Menu selections or prompts, for example, can be displayed in a fixed area of the screen, independent of data that is entered or accessed by the user.

Setup Status
By using the SETUP key, the display screen of the VT100 may be replaced by a status screen. The status screen allows the user to select character displays, transmission rates, and column settings, and then return to the display screen without interfering with information previously entered. Keyboard and computer settable tab stops are standard within the full 80 or 132 column range, and facilitate formatting columnar data.

Composite Video
The VT100 also provides composite video input and output. Composite video input enables the user to overlay video output from a remote terminal. Composite video output allows the VT100 to drive an auxiliary underscan monitor, supporting applications that involve displaying text or data to a group of people.

Detached Keyboard
For the convenience of the user, the typewriter-like keyboard of the VT100 is attached to the video display unit by a 6-foot, coil cord. This allows the user to place the keyboard in a variety of positions, providing a more comfortable and efficient workstation and saving desk space. Special function keys, including a scroll key, cursor control keys, and keys that transmit control codes increase the VT100's ease of use.

Numeric and Function Keypad
To the right of the keyboard is a built-in, calculator-style numeric and function keypad. This keypad, with one keystroke, can be used for numeric data entry and to indicate programmed functions commonly used at the terminal to host software. Seven light emitting diode (LED) indicators, four of which are program-controlled, serve as operator information and diagnostic aids.

Reliability
The VT100 has just two mechanical switches: one for turning the terminal on and off; the other for selecting the power supply voltage. All other functions (baud rates, tabs, parity, etc.) are set via the keyboard and stored in the non-volatile memory. The elimination of mechanical switches aids the use of diagnostics for testing the terminal functions and adapting to varying environments under host control.

Maintainability
The VT100, designed to be easy to maintain, has built-in, self-test diagnostics that greatly reduce the time necessary to isolate and repair faults. The use of snap fasteners instead of screw fasteners reduces the time and cost of repairs by providing easy access to and servicing of all components.

Options
Options for the VT100 include advanced video , printer port, a 20mA interface, foreign language and special character sets, and a terminal stand.

Advanced Video Option
Advanced video (VT1XX-AB) adds three capabilities: additional character attributes allowing any character to be displayed with a selectable combination of blinking, underlining, bold, and reverse video; space and connections for an alternate character set memory, thus allowing additional character sets to reside in the terminal; and extra screen memory for an additional 10 lines (24 lines total) of 132 column characters.

Printer Port Option
The printer port (VT1XX-AC), which requires the use of the advanced video option and XON-XOFF support from host, enables hardcopy printing off the video terminal, thus sharing one communication line between two peripherals. (EIA)RS-232-C compatible, the printer port also allows local print functions without host intervention.

20mA Option
The 20mA option (VT1XX-AA) is available for conversion from the EIA interface to a current loop interface for communications lengths exceeding 50 feet.

Foreign Language and Special Character Sets
Foreign language and special character sets may be obtained through Digital's Computer Special Systems (CSS) organization.

Terminal Stand
The VT100 terminal stand (VT1XX-ST) is a five leg stand with castors. It conveniently holds the VT100 terminal and keyboard.

SPECIFICATIONS

Characters	7×9 dot matrix with 2-dot descenders
Format	24 lines × 80 characters or 14 lines (24 optional) × 132 characters, selectable
Character Set	94-character ASCII and 32 special graphic features
Keyboard	83-key detachable unit with 6ft. (1.9m) coiled cord
Baud Rates (bps)	50, 75, 110, 134.5, 150, 200, 300, 600, 1200, 1800, 2000, 2400, 3600, 4800, 9600, 19200 (Operation at certain speeds requires XON-XOFF protocol or use of fill characters.)
Parity	Even, odd, or none, keyboard selectable
Communication	Full-duplex asynchronous
Interface	EIA Standard
Dimensions	
Monitor	14.5"H × 18"W × 14.25"D
Keyboard	3.5"H × 18"W × 8"D
Combined	14.5"H × 18"W × 20.25"D
Weight	34.5 lbs.(15.6kg)
Power	90-128 V RMS, 180-256 V RMS, switch-selectable; 47-63 Hz; 3 amp maximum

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VT102 Video Terminal

DATA SHEET

The VT102™ video display terminal is the ideal Digital systems terminal and a new standard for system users. The VT102 terminal is a fully optioned VT100 video terminal which offers a new level of functionality. VT100 advanced video and printer port features are built into the VT102 video display terminal to provide more functionality at a lower cost. In addition, the VT102 terminal features U.S. and European half- and full-duplex communications and modem controls, plus local echo. Advanced editing features allowing character and line insert and delete are standard. The VT102 video display terminal is an extremely versatile product. It can be used in timesharing environments or remote locations and communicates with both Digital and non-Digital systems. Available in models with word processing keycaps, the VT102 terminal can be used for both data processing and word processing. The VT102 video terminal is a totally self-contained terminal which has no functional upgrade options.

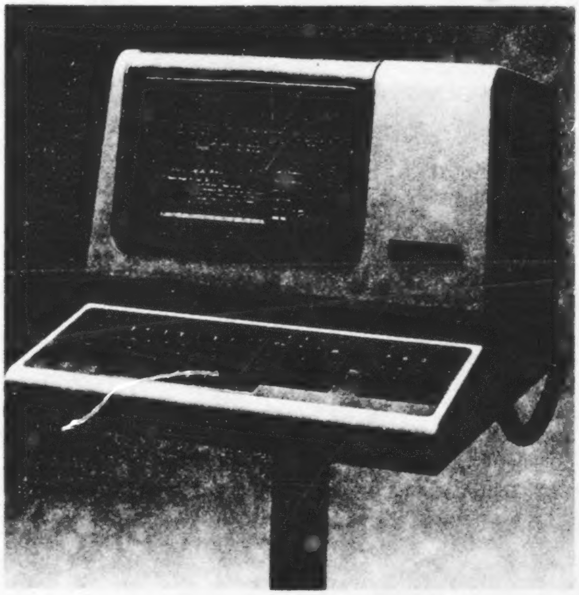
HIGHLIGHTS

Operator-Oriented Features

- Normal or reverse video, blinking, underline, and bold characters on a character-by-character basis
- Local print functions without host intervention
- Enhanced terminal editing features
- Selectable black characters on a white screen or white characters on a black screen
- Up to 132 characters per line
- Bidirectional smooth scrolling/split screen capability
- Sculptured typewriter-like detachable keyboard
- U.S. and British character sets standard, others optional
- Exceptionally easy to service
- Built-in self-test diagnostics on power-up

Engineering

- Full- or half-duplex communication using one of five modem control modes
- Local echo feature
- VT52 and ANSI compatible for easy upgrade
- Nonvolatile memory holds feature settings



DESCRIPTION

The VT102 video terminal features full VT100 terminal functionality plus local echo, built-in advanced video and printer port features, character/line insertion/deletion, and U.S./European full- and half-duplex communications with modem controls. The local echo feature allows the terminal to be used connected to non-Digital computer systems. The VT102 terminal takes advantage of available software for use on video terminals, such as Forms Management Systems— FMS and Indent, as well as EDT, an interactive text editor with screen editing and keypad editing. The VT102 terminal supports DECword™ word processing. The operator-oriented features of the VT102 make it an ideal terminal for applications where operator efficiency is of prime importance. Only 50.8 cm (20 in) deep, the VT102 terminal is small enough to fit on a standard typewriter table. The sculptured, typewriter-like keyboard permits easy transition from typewriter to terminal. The wide variety of user-controllable character and screen features allow the user to customize the screen for specific application needs.

Advanced Video

The advanced video feature enhances the user friendliness of many VT102 terminal applications. It adds attributes and allows any character to be displayed in a selectable combination of blinking, underlining, bold, and reverse video. These character attributes are used for formatting, prompting, exceptions, guidance, security control, and

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alarm. Digital video terminal support software packages—FMS, INDENT, and EDT—make optimum use of advanced video features for greater user productivity. The advanced video feature also allows a total of 24 lines of 80- or 132-column characters.

Modem Control

The VT102 terminal can communicate in either full-duplex or half-duplex using one of five modem control selections.

FDX A—Full-duplex; no EIA modem control. VT100/VT132 compatible mode.

FDX B—Full-duplex with EIA modem control.

FDX C—Asymetric full-duplex with EIA modem control.

HDX A—Half-duplex supervisory mode.

HDX B—Half-duplex coded control.

Possible Bell (or equivalent) modem configurations:

Public Switched	**Manual Originate Only**	**Manual Answer Only**	**Manual Originate Answer**	**Auto Answer**
300B/ FDX/2-W:	113A	113D	103A	103A
	113C		103J	103J
				113B
				113D
			212A	212A
1200B/ FDX/2-W:			212A	212A
1200B/ HDX/2-W: (has reverse channel)			202S	202S

Possible CCITT modem configurations:

Public Switched Telephone Network (2-wire only)

V.21—Modem (V.24/V.28), Async, FDX, up to 200/300B

V.22—Modem (V.24/V.28), Async, FDX, up to 1200B

V.23—Modem (V.24/V.28), Async, HDX, up to 1200B

FDX, Async, receive=600 or 1200B, transmit=reverse channel @ 75B

Dedicated line (2-W, 4-W)

V.21—Modem (V.24/V.28, 2-W), Async, FDX, 200/300B

V.23—Modem (V.24/V.28), FDX, Async, 1200B, 4-W

Public circuit switched network

DFG200-1—Germany

VC-DCE—Nordic network

VPC-DCE—Nordic network

X.20bis—(V.21) Data service unit (V.28), Async, FDX, up to 300B

Printer Port

The printer port feature enables hardcopy printing off the VT102 terminal, thus sharing one communication line between two peripherals. The printer port also allows local print functions without host intervention.

Smooth Scrolling

The smooth scroll feature of the VT102 terminal (in conjunction with the use of auto XON-XOFF transmission control) enables the user to read new lines of text easily, even if the transmission speed is high. The 132-column by 24-line format permits easy viewing of wide lineprinter reports, and allows these reports to be transferred directly from screen to printer without reformatting data.

Split Screen

The split screen capability allows portions of the 24-line screen to be scrolled separately. Menu selections or prompts can be displayed in a fixed area of the screen, independent of data that is entered or accessed by the user.

Setup Status

By using the *SETUP* key, the display screen of the VT102 terminal may be replaced by a status screen. The status screen allows the user to select character displays, transmission rates, and column settings, and then return to the display screen without interfering with information previously entered. Keyboard and computer adjustable tab stops are standard within the full 80- or 132-column range, and facilitate formatting columnar data.

Numeric and Function Keypad

To the right of the keyboard is a built-in, calculator-style numeric and function keypad. This keypad can be used for numeric data entry and to indicate host-programmed functions commonly used at the terminal. Seven light-emitting diode (LED) indicators serve as operator information and diagnostic aids.

Reliability

The VT102 video terminal has two mechanical switches: one for turning the terminal on and off; the other for selecting the power supply voltage. All other functions (baud rates, tabs, parity, etc.) are set via the keyboard and stored in the nonvolatile memory. The elimination of mechanical switches aids the use of diagnostics for testing the terminal functions and adapting to varying environments under host control.

Maintainability

The VT102 terminal is designed to be easy to maintain. It has built-in self-test diagnostics that greatly reduce the time necessary to isolate and repair faults. The use of snap fasteners instead of screw fasteners reduces the time and cost of repairs by providing easy access to and servicing of components.

Options

Options for the VT102 video terminal include a 20 mA interface, a terminal stand, a tilt/swivel base, high quality anti-glare panel, foreign language and special character sets, and keycap overlays.

20 mA Option
The 20 mA option (VT1XX-CA) is available for conversion from the EIA interface to a current loop interface for communications lengths exceeding 15.25 m (50 ft).

Terminal Stand
The terminal stand (VT1XX-ST) is a five-leg stand with castors. It conveniently holds the VT102 terminal and keyboard.

Tilt/Swivel Base
The tilt/swivel base (VT1XX-SA) is a base assembly which provides an upward tilt of 15° and a downward tilt of 7.5° plus a 180° swivel capability for the VT100 family of video terminals.

High Quality Anti-Glare Panel
The VT100 family anti-glare panel reduces glare, enhances character contrast, improves screen readability, and is easily installed and removed. It is available in the following colors: gray(VT1XX-FA), green(VT1XX-FB), and bronze(VT1XX-FC).

Foreign Language and Special Character Sets
Foreign language and special character sets may be obtained through the Digital Computer Special Systems (CSS) organization.

Keycap Overlays
Preprinted plastic keypad overlays are available to represent Digital KED/EDT (VT1XX-KA), FMS/FED (VT1XX-KB), and FMS/FDV (VT1XX-KC) software packages.

SPECIFICATIONS

Characters	7X10 dot matrix with 2-dot descenders
Format	24 lines X 80 or 132 characters, selectable
Character Set	94-character ASCII and 32-character special graphic characters
Keyboard	83-key detachable unit with 1.9 m (6 ft) coiled cord
Baud Rates (b/s)	50, 75, 110, 134.5, 150, 200, 300, 600, 1200, 1800, 2000, 2400, 3600, 4800, 9600, 19200 (Operation at certain speeds requires XON-XOFF protocol or use of fill characters.)
Parity	Odd, even, mark, space, or none—keyboard-selectable
Communication	Half-duplex, full-duplex with/without modem control, or asymetric full-duplex, Local echo selectable

Interface	EIA RS232-C standard
Dimensions	
Monitor	36.8 cm H X 45.7 cm W X 36.2 cm D (14.5 in H X 18 in W X 14.2 in D)
Keyboard	8.9 cm H X 45.7 cm W X 20.3 cm D (3.5 in H X 18 in W X 8 in D)
Combined	36.8 cm H X 45.7 cm W X 51.4 cm D (14.5 in H X 18 in W X 20.25 in D)
Weight	18.6 kg (41 lb)
Power	0.80 A RMS maximum at 120V RMS 0.40 A RMS maximum at 240V RMS, switch-selectable 47-63 Hz
Power Cords	VT102 terminal can be ordered with U.S. or European power cords:

MODEL	U.S./GIA	U.K.	CONTINENTAL EUROPE	SWISS
VT102 EIA CRT terminal Non-expandable Built-in A.V.O. & Printer Port	**VT102-AA** (120V) **VT102-AB** (240V) both have U.S. plug	VT102-A2 includes 240V power cord & U.K. plug	VT102-A3 includes 220V power cord & Cont. Eur. plug	VT102-A4 includes 220V power cord & Swiss plug
VT102 Terminal with Word processing keys	**VT102-WA** (120V) **VT102-WB** (240V) both have U.S. plug	VT102-W2 includes 240V power cord & U.K. plug	VT102-W3 includes 220V power cord & Cont. Eur. plug	VT102-W4 includes 220V power cord & Swiss plug

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DIGITAL EQUIPMENT CORP

VAX-11/780 System Report

NEW 32-BIT MINICOMPUTER

On October 25, 1977, Digital Equipment Corp. announced its first 32-bit minicomputer system. The new computer, which has been the subject of computer industry gossip for approximately a year, is called VAX-11/780.

VAX-11/780 occupies an unique place within Digital's product lineup. It was almost expected that Digital's entrance into the 32-bit minicomputer market would be accompanied by all the fireworks and fanfare that would signal an end to the era of the 16-bit minicomputer. Hardly. VAX-11/780 is not represented as a revolutionary product, but as an evolutionary extension of Digital's popular PDP-11 series of minicomputers. In line with this philosophy, VAX-11/780 offers several methods by which compatibility links can be established with the PDP-11 series.

VAX Software

Digital has introduced a new virtual memory operating system for VAX-11/780 called VAX/VMS. It is described as an operating system designed to handle time-critical applications in an interactive environment. In support of this orientation, VAX-VMS can handle up to 64 interactive users simultaneously. Full demand paging allows programs to be written or called in variable-sized segments. Programs can be as large as 32M bytes. Memory management facilities allow a user to lock pages or entire programs in memory to prevent them from being swapped out.

Batch facilities for VAX/VMS include job control, input and output spooling, and multi-stream job scheduling. Record and file organization can be sequential or relative, with sequential and random access.

Digital has released a FORTRAN IV-PLUS that takes full advantage of VAX's 32-bit architecture. All other languages, BASIC-PLUS-2, COBOL-74, and MACRO, run on VAX in a 16-bit emulation mode.

Software for the commercial user is not much in evidence. Also, there is currently no record or file management software or data base management software.

Digital has taken care, however, to provide a form of software compatibility with the most popular PDP-11 operating system, RSX-11 (M or S versions).

VAX Architecture

The architecture of VAX-11/780 is one of its most intriguing features. While it has several similarities to the architecture of the high-end PDP-11 model, the PDP-11/70, it is different, and more importantly Digital appears to have thrown a large amount of development time and dollars into the new architecture.

Simply, VAX-11/780 has three buses. Two are familiar – the asynchronous UNIBUS and MASSBUS that are on the PDP-11/70. The MASSBUS supports high-speed mass storage devices and the UNIBUS supports slower speed storage devices and standard I/O devices. Both buses are 18 bits wide, just as on the PDP-11/70, and support the standard PDP-11 peripherals (no new peripherals have been introduced for VAX-11/780).

The new bus, called the Synchronous Backplane Interface (SBI), is, as the name states, synchronous, and most significantly has a very high bandwidth rate of (13.3M bytes/second). The SBI is 32 bits wide and serves as the main data transfer path; one UNIBUS adapter and up to four MASSBUS adapters can be connected to it, and both main memory and cache memory interface to it.

Main memory for VAX is Error Correcting and Checking (ECC) 600-nanosecond MOS. Real memory is expandable from 128K bytes to 2M bytes. Virtual memory can be up to 4.3 billion bytes. All systems also include 8K bytes of cache memory, which, assuming a 95 percent hit rate, yields a memory access time of 290 nanoseconds.

See Table 1 for VAX-11/780 system specifications.

Deliveries are scheduled to begin early in 1978, with volume deliveries beginning in mid-1978.

RELATIONSHIP WITH OTHER DIGITAL EQUIPMENT PRODUCTS

The first question on everyone's mind when Digital announced VAX was its potential impact on the

HEADQUARTERS

Digital Equipment Corp
146 Main St
Maynard MA 01754
(617) 897-5111

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Table 1. Digital Equipment VAX–11/780: Mainframe Specifications

Central Processor	
Type	Microprogrammed
No. of Registers	Sixteen 32-bit general-purpose
Addressing	
No. of Modes	9
Direct (bytes)	2M
Indirect (bytes)	3 billion
Indexed (bytes)	3 billion
Instruction Set	
No. (std)	243
Decimal Arithmetic	Yes, std
Floating-Pt Arithmetic	Yes, std; high-performance unit opt
Writable Control Store	Std 12KB (for Digital's use); opt 12KB(1)
Priority Interrupt Levels	32; 16 hardware & 16 software
Main Memory	
Type	ECC MOS
Cycle Time (ns)	600
Basic Addressable Unit	8-bit byte
Cache Memory	Std 8KB; 290-ns effective access time
Min Capacity (bytes)	128K
Max Capacity (bytes)	2M
Increment Size (bytes)	128K, 256K, or 512K
Protection Method	4 hierarchical protection modes
I/O Throughput Rates	
Sync Backplane Interconnect (SBI)	13.3MB/sec
MASSBUS	2MB/sec
UNIBUS	1.5MB/sec
Integral Diagnostic Subsytem	
CPU	LSI-11 with 16KB of RAM & 8KB of ROM
I/O Devices	RX01 floppy disk; LA36
Date Announced	October 25, 1977
1st Volume Deliveries	Mid-1978

(1) WCS not supported by VAX/VMS software

company's legendary PDP-11 product line. Digital answered the question by describing VAX-11/780 as an upward extension of the top-end PDP-11/70, and outlining provisions for compatibility. The 16-bit machine's instruction set, except for floating-point, memory management, and privileged instructions, is a subset of the new 32-bit machine's instruction set.

An Application Migration Executive has been released with VAX/VMS to allow PDP-11 RSX programs to run on the new machine in a compatibility mode. There will be some problem in terms of compatibility when it comes to device driver routines, because of the different I/O architectures of the PDP-11 and VAX/VMS. All device driver routines would need to be rewritten.

Digital has also announced DECNET Phase 2 support for VAX, which permits point-to-point communications with other Digital systems. However, at the time of writing none of the other Digital operating systems support Phase 2 of DECNET, which leaves only VAX-to-VAX communications.

There is no form of compatibility or bridge between VAX-11/780 and the medium- or large-scale DECsystem-20 or -10.

OTHER 32-BIT MINICOMPUTERS

Competition in the 32-bit minicomputer market is limited by the number of competitors. Aside from Digital's new entry, only Systems Engineering Laboratories (SEL) and Interdata make true 32-bit minicomputers.

Like its major competitors, the SEL 32 and Interdata 8/32, VAX-11/780 will appeal to the OEM and sophisticated end-user markets. All of these systems are characterized by brute-strength hardware, but relatively weak software. It is up to the user, in most cases, to take the processing potential that Digital Equipment, SEL, and Interdata 32-bit machines offer and tame it into a manageable resource.

Digital's entrance into the 32-bit minicomputer market can mean two things. One, it may be taking on SEL and Interdata in their traditional 32-bit marketplaces, and grabbing a piece of the currently existing marketplace that knows it wants a 32-bit machine. Or, second, Digital may be exercising its role as a minicomputer industry leader and setting out to create new markets and demands for the 32-bit machine. There is virtually an unlimited potential market for an interactive machine that can handle large, data-base oriented commercial applications.

CONFIGURATION GUIDE

There are three basic VAX-11/780 system configurations. Differences in basic systems are mainly in the amount of MOS main memory that they support and the type of auxiliary storage packaged in the configuration.

All systems are configured with the following: the VAX-11/780 central processor with virtual memory management, bootstrap loader, standard set of 243 instructions, 8K bytes of parity bipolar cache memory, programmable real-time clock (with battery backup), and 12K bytes of writable control store for Digital Equipment's use in performing system diagnostics. All are packaged with the VAX/VMS operating system and an LA36 DECwriter II.

A diagnostic subsystem is a feature of the new systems that the Digital marketing staff is quick to point out. The subsystem can be used for both local and remote diagnostics. It includes Digital's own LSI-11 microcomputer with 16K bytes of read/write memory and 8K bytes of Read Only Memory (ROM) and an RX01 floppy disk; it uses the LA36 that is part of the standard configuration.

DIGITAL EQUIPMENT CORP

VAX Systems Price Data

Model	Description	Purchase Price $	Monthly Maint $/Mo
	VAX-11/750 SYSTEMS		
SV-BXHHA-AA	VAX-11/750 System (incl CPU w/512KB ECC MOS memory, VAX/VMS operating sys, virtual memory management, bootstrap loader, std instructions for both floating- & fixed-pt arithmetic, 4KB bipolar cache memory w/parity, prgmbl real-time clock, time-of-year clock w/battery backup, RK711 UNIBUS control., 2 top-loading RK07 cartridge disk drives for total of 56MB on-line storage, one DZ11-A async mux for connection to 8 EIA comm lines, LA38 DECwriter IV console term., integral TU58 tape cartridge unit, & 120v AC, 60 Hz power supply)	89,900	568
-AD	Same as SV-BXHHA-AA except w/240v AC, 50 Hz power supply	89,900	568
-BXTAA-AA	VAX-11/750 System (incl CPU w/1MB ECC MOS memory; VAX/VMS operating sys; virtual memory management; bootstrap loader; std instructions for both floating- & fixed-pt arithmetic; 4KB bipolar cache memory w/parity; prgmbl real-time clock; time-of-year clock w/battery backup; one RGM03 single-access 67MB disk drive w/MASSBUS adapter; TS11 45-ips, 1,600-bpi mag tape subsys w/UNIBUS control.; one DZ11-A async mux for connection to 8 EIA comm lines; LA38 DECwriter IV console term.; integral TU58 tape cartridge unit; & 120v AC, 60 Hz power supply)	125,000	534
-AD	Same as SV-BXTAA-AA except w/240v AC, 50 Hz power supply	125,000	534
-BXWAA-AA	VAX-11/750 System (incl CPU w/1MB ECC MOS memory; VAX/VMS operating sys; virtual memory management; bootstrap loader; std instructions for both floating- & fixed-pt arithmetic; 4KB bipolar cache memory w/parity; prgmbl real-time clock; time-of-year clock w/battery backup; one RGM80 single-access, 124MB fixed media disk drive w/MASSBUS adapter; TS11 45-ips, 1,600-bpi mag tape subsys w/UNIBUS control.; one DZ11-A async mux for connection to 8 EIA comm lines; LA38 DECwriter IV console term.; integral TU58 tape cartridge unit; & 120v AC, 60 Hz power supply)	120,000	526
-AD	Same as SV-BXWAA-AA except w/240v AC, 50 Hz power supply	120,000	526
	VAX-11/780 SYSTEMS		
SV-AXCBB-CA	VAX-11/780 System (incl CPU w/1.5MB ECC MOS memory; VAX/VMS operating sys; virtual memory management; bootstrap loader; std instructions for both floating- & fixed-pt arithmetic; packed dec, char. & string manipulations; 8KB bipolar cache memory w/parity; prgmbl real-time clock; time-of-year clock w/battery backup; 12KB writable diagnostic control storage, one REP06 single-access, 176MB disk drive w/MASSBUS adapter; TEU77 125-ips, 800-/1,600-bpi mag tape transport unit w/MASSBUS adapter; one DZ11-A async mux for connection to 8 EIA comm lines; integral diagnostic console subsys; 120v AC, 60 Hz power supply; & LA120 DECwriter III term.)	257,600	1,174
-CD	Same as SV-AXCBB-CA except w/240v AC, 50 Hz power supply	257,600	1,174
-AXDBB-CA	VAX-11/780 System (incl CPU w/1.5MB ECC MOS memory; virtual memory management; bootstrap loader; std instructions for packed dec, char. & string manipulations, & both floating- & fixed-pt arithmetic; 8KB bipolar cache memory w/parity; prgmbl real-time clock; time-of-year clock w/ battery backup; 12KB writable diagnostic control storage; one REM05 single-access, 256MB disk drive w/MASSBUS adapter; TEU77 125-ips, 800-/ 1,600-bpi mag tape transport unit w/MASSBUS adapter; one DZ11-A async mux for connection to 8 EIA comm lines; integral diagnostic console subsys; 120v AC, 60 Hz power supply, & LA120 DECwriter III console term.)	257,600	1,264
-CD	Same as SV-AXDBB-CA except w/240v AC, 50 Hz power supply	257,600	1,264
-AXHHV-CA	VAX-11/780 System (incl CPU w/512KB ECC MOS memory; VAX/VMS operating sys; virtual memory management; bootstrap loader; std instructions for packed dec, char. & string manipulations, & floating- & fixed-pt arithmetic; 8KB bipolar cache memory w/parity; prgmbl real-time clock; time-of-year clock w/battery backup; 12KB writable diagnostic control storage; an RK711 UNIBUS control. w/2 top-loading RK07 cartridge disk drives for total of 56MB on-line storage; one DZ11-A async mux for connection to 8 EIA comm lines; integral diagnostic console subsys; 120v AC, 60 Hz power supply, & LA120 DECwriter III console term.)	143,000	741
-CD	Same as SV-AXHHV-CA except w/240v AC, 50 Hz power supply	143,000	741
-AXTBB-CA	VAX-11/780 System (incl CPU w/512KB ECC MOS memory; VAX/VMS operating sys; virtual memory management; bootstrap loader; std instructions for packed dec, char. & string manipulations, & floating- & fixed-pt arithmetic; 8KB bipolar cache memory w/parity; prgmbl real-time clock; time-of-	230,000	1,014

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Model	Description	Purchase Price $	Monthly Maint $/Mo
	year clock w/battery backup; 12KB writable diagnostic control storage; an REM03 single-access, 67MB disk drive w/MASSBUS adapter; TEU77 125-ips, 800-/1,600-bpi mag tape transport unit w/MASSBUS adapter; one DZ11-A async mux for connection to 8 EIA comm lines; integral diagnostic console subsys; 120v AC, 60 Hz power supply; & LA120 DECwriter III console term.)		
-CD	Same as SV-AXTBB-CA except w/240v AC, 50 Hz power supply	230,000	1,014
-AXTVB-CA	Same as SV-AXTBB-CA except w/512KB ECC MOS memory & TEE16 45-ips, 800-/1,600-bpi mag tape transport w/MASSBUS adapter	196,000	816
-CD	Same as SV-AXTBB-CD except w/512KB ECC MOS memory & TEE16 45-ips, 800-/1,600-bpi mag tape transport unit w/MASSBUS adapter	196,000	816
-AXWBA-CA	VAX-11/780 System (incl CPU w/1MB ECC MOS memory; VAX/VMS operating sys; virtual memory management; bootstrap loader; std instructions for packed dec, char. & string manipulations, & floating- & fixed-pt arithmetic; 8KB bipolar cache memory w/parity; prgmbl real-time clock; time-of-year clock w/battery backup; 12KB writable diagnostic control storage; an REM80 single-access, 124MB fixed media disk drive w/MASSBUS adapter; TEU77 125-ips, 800-/1,600-bpi mag tape transport unit w/MASSBUS adapter; one DZ11-A async mux for connection to 8 EIA comm lines; integral diagnostic console subsys; 120v AC, 60 Hz power supply, & LA120 DECwriter III console term.)	225,000	969
-CD	Same as SV-AXWBA-CA except w/240v AC, 50 Hz power supply	225,000	969

		Purchase Price $	Monthly Maint $/Mo	Installation Charge $
	VAX PROCESSOR & MEMORY OPTIONS			
	VAX-11/780 Processor Options			
FP780-AA(AB)	Floating-Point Accelerator (for single- & dbl-precision floating-pt instructions plus POLY, EMOD, & MULL; incl power supply)	10,600	45	462
DW780-AA(AB)	UNIBUS Adapter (incl interface logic, power supply, UNIBUS cable, & UNIBUS terminator)	12,300	35	559
DR780-AA(AB)	General-Purpose Interface (connects customer-designed devices to a VAX-11/780 or connects two VAX-11/780 sys)	18,700	80	494
KU780-YY	12KB User-Writable Control Storage	10,700	50	359
	VAX-11/750 Processor Option			
KU750-YG	10KB User-Writable Control Storage (1K 80-bit wds)	6,000	CSQ	CSQ
	VAX-11/780 Expansion Memory			
MS780-CC(CD)	512KB ECC MOS Chip Memory with Controller (16KB chip)	26,600	150	527
-DA	256KB ECC MOS Expansion Memory (for MS780-CC[CD])	9,100	55	388
-DB	512KB ECC MOS Expansion Memory (for MS780-CC [CD])	13,900	110	449
-DC	1MB ECC MOS Expansion Memory (for MS780-CC [CD])	19,800	220	521
-DD	2MB ECC MOS Expansion Memory (for MS780-CC [CD])	31,900	440	58[illegible]
	VAX-11/750 Expansion Memory			
MS750-AA	256KB ECC MOS Expansion Memory	9,100	55	243
-AB	512KB ECC MOS Expansion Memory	13,900	110	269
-AC	1MB ECC MOS Expansion Memory	19,800	220	322
	VAX-11/780 Multiport Memory Options			
MA780-AA(AB)	256KB ECC MOS Multiport Memory Subsystem (provides up to 11MB/sec total thruput; can be shared by up to 4 VAX-11/780 sys; incl control., 2 MA780-C port interfaces w/cables, cabinet, power supply, & expansion space for up to 2MB ECC MOS memory, an MA780-BA [BB] subsys, connection of 2 addl port interfaces, & memory battery backup opt.)	37,300	170	826
-BA(BB)	Additional MA780 Multiport Memory Subsystem (incl control., 256KB ECC MOS memory that can be shared by up to 4 VAX-11/780 sys, 2 MA780-C port interfaces w/cables, power supply, & expansion space for up to 2MB ECC MOS memory, connection of 2 addl port interfaces, & memory battery backup opt.)	32,700	170	826
-C	MA780 Multiport Memory Port Interface (req for 3rd or 4th VAX-11/780 CPU connected to either MA780-AA [AB] or MA780-BA [BB])	7,000	20	515
-D	VAX-11/780 Multiport Memory Selective Cache Invalidate Option (recommended for 3- and 4-proc sys; req MA780-AA[AB] or MA780-BA[BB])	9,000	55	415

Model	Description	One-Time License $
-AQ	MUBASIC-11/RT-11 (on RL01 disk cartridge)	1,150
-AY	MUBASIC-11/RT-11 (on RX01 diskette)	1,150
QJ909-AD	APL-11/RT (on 9-trk, 800-bpi mag tape)	3,450
-AE	APL-11/RT (on RK05 disk cartridge)	3,450
-AG	APL-11/RT (on DECtape II)	3,450
-AH	APL-11/RT (on RL02 disk cartridge)	3,500
-AY	APL-11/RT (on RX01 diskette)	3,450
QJ685-AD	DECnet-RT (on 9-trk, 800-bpi mag tape)	1,750
-AE	DECnet-RT (on RK05 disk cartridge)	1,750
-AG	DECnet-RT (on DECtape II)	1,750
-AM	DECnet-RT (on 9-trk, 1,600-bpi mag tape)	1,750
-AQ	DECnet-RT (on RL01 disk cartridge)	1,750
-AT	DECnet-RT (on RK06 disk cartridge)	2,000
-AV	DECnet-RT (on RK07 disk cartridge)	2,100
-AX	DECnet-RT (on RX02 diskette)	1,750
-AY	DECnet-RT (on RX01 diskette)	1,750
QJD59-AD	RT-11 2780/3780 Protocol Emulator (on 9-trk, 800-bpi mag tape)	2,900
-AE	RT-11 2780/3780 Protocol Emulator (on RK05 disk cartridge)	2,900
-AG	RT-11 2780/3780 Protocol Emulator (on DECtape II)	2,900
-AH	RT-11 2780/3780 Protocol Emulator (on RL02 disk cartridge)	2,950
-AQ	RT-11 2780/3780 Protocol Emulator (on RL01 disk cartridge)	2,900
-AX	RT-11 2780/3780 Protocol Emulator (on RX02 diskette)	2,900
-AY	RT-11 2780/3780 Protocol Emulator (on RX01 diskette)	2,900
QJ713-AE	FMS-11/RT-11 (on RK05 disk cartridge)	2,700
-AG	FMS-11/RT-11 (on DECtape II)	2,700
-AH	FMS-11/RT-11 (on RL02 disk cartridge)	2,750
-AQ	FMS-11/RT-11 (on RL01 disk cartridge)	2,700
-AY	FMS-11/RT-11 (on RX01 diskette)	2,700

Notes:

NC No charge

NA Not applicable

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Model	Description	Purchase Price $	Monthly Maint $/Mo	Installation Charge $
	PERIPHERALS			
	Magnetic Tape Subsystems			
TEE16-AE(AJ)	Magnetic Tape Transport with VAX-11/780 MASSBUS Adapter (prog-selectable 800/1,600 bpi, 9 trk, 45 ips; expandable to a total of 8 TE16 transports & 7 MASSBUS disk drives; req VAX-11/780)	25,000	147	911
TEU45-KA(KB)	Magnetic Tape Transport with VAX-11/780 MASSBUS Adapter (prog-selectable 800/1,600 bpi, 9 trk, 75 ips; expandable to a total of 8 TU45 transports & 7 MASSBUS disk drives; req VAX-11/780)	29,000	265	911
TEU77-AB(AD)	Magnetic Tape Transport with VAX-11/780 MASSBUS Adapter (prog-selectable 800/1,600 bpi, 9 trk, 125 ips; expandable to a total of 4 TU77 transports & 7 MASSBUS disk drives; req VAX-11/780)	34,800	235	1,028
TGU77-AB(AD)	Magnetic Tape Transport with VAX-11/750 MASSBUS Adapter (prog-selectable 800/1,600 bpi, 9 trk, 125 ips; expandable to a total of 4 TU77 transports & 7 MASSBUS disk drives; req VAX-11/750)	34,800	235	1,028
	Add-On Magnetic Tape Drives			
TE16-AE(AJ)	Magnetic Tape Transport Unit (prog-selectable 800/1,600 bpi, 9 trk, 45 ips; req TEE16 mag tape subsys)	15,000	87	434
TU45-KE(KF)	Magnetic Tape Transport Unit (prog-selectable 800/1,600 bpi, 9 trk, 75 ips; req TEU45 mag tape subsys)	18,000	205	434
TU77-AF(AJ)	Magnetic Tape Transport Unit (prog-selectable 800/1,600 bpi, 9 trk, 125 ips; auto. loading; req TEU77 or TGU77 mag tape subsys)	23,100	175	552
	Magnetic Tape Transports			
TS11-BA(BB)	Magnetic Tape Transport and Control Unit (1,600 bpi, 9 trk, 45 ips; req VAX-11/780)	15,400	75	360
-CA(CB)	Magnetic Tape Transport and Control Unit (1,600 bpi, 9 trk, 45 ips; req VAX-11/750)	15,400	75	360
	Printers			
LA11-PA(PD)	Matrix Printer and Control Unit (180 cps, 132 col, 96 char.)	4,050	55	150
LP11-AA	Band Printer and Control Unit (285 lpm, 132 col, 64 char.)	7,800	90	264
-BA	Band Printer and Control Unit (132 col, 285 lpm w/64-char. set or 204 lpm w/96-char. set)	8,400	90	264
-CA(CD)	High-Speed Printer and Control Unit (900 lpm, 132 col, 64 char.)	25,700	185	359
-DA(DD)	High-Speed Printer and Control Unit (660 lpm, 132 col, 96 char.)	27,500	185	359
-VA(VD)	Printer and Control Unit (300 lpm, 132 col, 64 char.)	12,600	155	359
-WA(WD)	Printer and Control Unit (240 lpm, 132 col, 96 char.)	15,000	155	359
-YA(YD)	Printer and Control Unit (600 lpm, 132 col, 64 char.)	20,200	150	359
-ZA(ZD)	Printer and Control Unit (436 lpm, 132 col, 96 char.)	21,900	150	359
LPR11-VA(VD)	Remote Printer Subsystem (250 lpm, 132 col, 64 char.)	19,000	207	612
-WA(WD)	Remote Printer Subsystem (240 lpm, 132 col, 96 char.)	21,500	207	612
-YA(YD)	Remote Printer Subsystem (525 lpm, 132 col, 64 char.)	26,600	230	612
-ZA(ZD)	Remote Printer Subsystem (420 lpm, 132 col, 96 char.)	28,400	230	612
	Card Readers			
CR11(A)	Card Reader and Control Unit (300 cpm)	7,500	66	386
-BC(BD)	Card Reader and Control Unit (600 cpm)	10,700	68	434
CME11-KA(KB)	Card Reader and Control Unit (250 cpm w/60 Hz power supply or 200 cpm w/50 Hz power supply)	4,500	66	386
	Terminals			
LA34-DA	DECwriter IV Printing Terminal (tabletop; incl universal power supply, std EIA interface, & null modem cable; provides variable horiz tabs & margins, 4 char. sizes, 6 line spacings, & printhd adjustment; 9-x-7 dot matrix char. generation, 30-cps print speed, & baud rates up to 300 bps; accommodates single sheets & roll paper; req DZX11-A or DZ11-E)	1,450	16	150
LA38-GA	DECwriter IV Printing Terminal (same as LA34-DA except accommodates up to a 4-part computer form; provides 18-button num keypad; req DZ11-A or DZ11-E)	1,600	16	150
-HA	DECwriter IV Printing Terminal (same as LA34-DA except freestanding; provides 18-button num keypad)	1,700	16	168
LA120-DA	DECwriter III High-Speed Interactive Terminal (freestanding; 180 cps; provides bidirectional printing w/baud rates up to 9,600 bps; incl universal power supply, std EIA interface, 1K-char. buffer, & 7-x-7 dot matrix char. generation)	2,800	30	150

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DIGITAL EQUIPMENT — VAX SYSTEMS PRICE DATA

Model	Description	Purchase Price $	Monthly Maint $/Mo	Installation Charge $
VT100-AA(AB)	Video Display Terminal (tabletop; incl dbl-width/dbl-size char., 80-col-x-24-line print line, 95-char. detachable kybd, line-drawing graphics char., smooth scrolling, split screen, composite vid, & std EIA interface; operates on async FDX comm lines)	2,050	17	150
VT1xx-AB	Advanced Video Option (provides BOLD, BLINK, UNDERLINE, & REVERSE VIDEO in any comb.; adds 10 lines of 132-col data for a total of 132 col x 24 lines)	290	3	132
VT1xx-AA	20mA Current-Loop Adapter (allows VT100 term. to connect to a 20mA current-loop interface)	130	3	132
	UNIBUS COMMUNICATIONS OPTIONS			
	Asynchronous Multiplexors			
DZ11-A	Asynchronous Multiplexor (8 lines; for connection of EIA/CCITT term. or lines)	2,450	29	269
-B	Expansion Multiplexor (adds 8 lines to DZ11-A)	1,950	25	214
-C	Asynchronous Multiplexor (8 lines for connection of 20mA current-loop term)	2,550	29	269
-D	Expansion Multiplexor (adds 8 lines to DZ11-C)	2,000	25	214
-E	Asynchronous Multiplexor (16 lines; for connection of EIA/CCITT term. or lines)	4,100	50	379
-F	Asynchronous Multiplexor (16 lines; for connection of 20mA current-loop terms.)	4,250	50	379
	GENERAL-PURPOSE UNIBUS INTERFACES			
DR11-B	High-Speed Direct Memory Access Interface (moves data directly between user's device & memory; incl wd count, current addr, & data reg; req VAX-11/780)	1,750	14	228
PCL11-B	High-Speed Multiple Computer Link (500KB/sec; allows for interconnection of up to 16 VAX-11/780 and/or PDP-11 UNIBUS computers in local network; req VAX-11/780)	7,300	60	490
LPA11-K	High-Speed Direct Memory Access Controller (allows concurrent multi-user control of analog-to-digital converters)	5,300	43	485
-KK	Direct Memory Access Controller (incl ADK11-KT analog-to-digital converter package & DD11-CK backplane)	8,300	92	509
AA11-KT	Digital-to-Analog Converter (incl distribution panel & cable; req LPA11-K & KW11-K)	1,450	7	193
ADK11-KT	Analog-to-Digital Converter (incl KW11-K real-time clock, distribution panel, & 2 cables)	3,650	50	241
DR11-KT	General-Purpose Digital Interface (incl distribution panel & 2 cables; req LPA11-K & KW11-K)	1,200	7	173
AA11-K	Digital-to-Analog Converter (4 chan, 12 bits; req LPA11-K & KW11-K)	1,250	7	158
AD11-K	Analog-to-Digital Converter (12 bits, 16-chan single ended/8-chan true differential; incl self-test & software-controlled Vernier offset; req LPA11-K & KW11-K)	2,600	33	208
AM11-K	Differential Expander or Switch Gain Multiplexor (48-chan single ended/24-chan differential; 6 gain levels per 16 chan; req LPA11-K plus AD11-K & KW11-K or ADK11-KT)	1,250	15	214
DR11-K	General-Purpose Digital Interface (allows bidirectional 16-bit parallel Xfers between user's device & the UNIBUS; req LPA11-K & KW11-K)	820	7	145
KW11-K	Dual Programmable Real-Time Clock (distributes signals from two 40-pin Berg connectors to nine 10-screw term. strips)	1,050	18	138

Model	Description	One-Time License $
	SOFTWARE	
	VAX/VMS Operating System	
QE001-AM	VAX-11/780 VAX/VMS (on 9-trk mag tape)	20,000
-AV	VAX-11/780 VAX/VMS (on RK07 disk cartridge)	20,000
QD001-AM	VAX-11/750 VAX/VMS (on 9-trk mag tape)	20,000
-AV	VAX-11/750 VAX/VMS (on RK07 disk cartridge)	20,000
	Languages	
QE100-AY	VAX-11/780 VAX-11 FORTRAN (on diskette)	7,000
QD100-AG	VAX-11/750 VAX-11 FORTRAN (on TU58 tape cartridge)	7,000
QE099-AY	VAX-11/780 VAX-11 COBOL (on diskette)	12,000
QD099-AG	VAX-11/750 VAX-11 COBOL (on TU58 tape cartridge)	12,000
QE101-AY	VAX-11/780 VAX-11 COBOL-74 (on diskette)	8,900
QD101-AG	VAX-11/750 VAX-11 COBOL-74 (on TU58 tape cartridge)	8,900

Model	Description	Purchase Price $	Monthly Maint $/Mo	Instal-lation Charge $
	PERIPHERALS (MASSBUS OPTIONS) **Disks**			
REM03-AA(AD)	Single-Access Removable Disk Pack Drive with VAX-11/780 MASSBUS Adapter (67MB; freestanding; incl one REM03-P disk pack; expandable to a total of 8 MASSBUS disk drives)	30,300	170	1,194
RGM03-AA(AD)	Same as REM03-AA(AD) except with VAX-11/750 MASSBUS adapter	30,300	170	1,194
REM03-BA(BD)	Dual-Access Removable Disk Pack Drive with Two VAX-11/780 MASSBUS Adapters (67MB; freestanding; incl one REM03-P disk pack; expandable to a total of 8 MASSBUS disk drives)	39,900	215	1,532
RGM03-BA(BD)	Same as REM03-BA(BD) except with Two VAX-11/750 MASSBUS Adapters	39,900	215	1,532
REM05-AA(AB)	Single-Access Removable Disk Pack Drive with VAX-11/780 MASSBUS Adapter (256MB; incl RM05-P disk pack; expandable to a total of 8 MASSBUS disk drives)	44,000	310	1,242
-BA(BB)	Dual-Access Removable Disk Pack Drive with Two VAX-11/780 MASSBUS Adapters (256MB; incl RM05-P disk pack; expandable to a total of 8 MASSBUS disk drives)	56,600	395	2,152
REM80-AA(AD)	Single-Access Fixed Media Disk Drive with VAX-11/780 MASSBUS Adapter (124MB; freestanding; expandable to a total of 8 MASSBUS disk drives)	29,900	125	747
RGM80-AA(AD)	Same as REM80-AA(AD) except with VAX-11/750 MASSBUS Adapter	29,900	125	747
REM80-BA(BD)	Dual-Access Fixed Media Disk Drive with Two VAX-11/780 MASSBUS Adapters (124MB; freestanding; expandable to a total of 8 MASSBUS disk drives)	39,500	170	1,085
RGM80-BA(BD)	Same as REM80-BA(BD) except with Two VAX-11/750 MASSBUS Adapters	39,500	170	1,085
REP06-AA(AB)	Single-Access Removable Disk Pack Drive with VAX-11/780 MASSBUS Adapter (176MB; freestanding; expandable to a total of 8 MASSBUS disk drives)	44,000	220	1,580
RGP06-AA(AB)	Same as REP06-AA(AB) except with VAX-11/750 MASSBUS Adapter	44,000	220	1,580
REP06-BA(BD)	Dual-Access Removable Disk Pack with Two VAX-11/780 MASSBUS Adapters (176MB; freestanding; incl RP06-P disk pack; expandable to a total of 8 MASSBUS disk drives)	56,600	270	1,608
RGP06-BA(BD)	Same as REP06-BA(BB) except with Two VAX-11/750 MASSBUS Adapters	56,600	270	1,608
	Add-On Disk Drives			
RM03-AA(AD)	Single-Access Removable Disk Pack Drive (67MB; freestanding; incl one RM03-P disk pack; req VAX-11/780 or VAX-11/750 MASSBUS adapter)	20,300	140	683
-BA(BD)	Dual-Access Removable Disk Pack Drive (67MB; freestanding; incl one RM03-P disk pack; req VAX-11/780 or VAX-11/750 MASSBUS adapter)	22,500	155	938
RM05-AA(AB)	Single-Access Removable Disk Pack Drive (256MB; incl RM05-P disk pack; req VAX-11/780 MASSBUS adapter)	34,000	240	690
-AC(AD)	Single-Access Removable Disk Pack Drive (256MB; incl one RM05-P disk pack; packaged in one freestanding disk cabinet; req VAX-11/780 MASSBUS adapter)	34,000	240	690
-BA(BB)	Dual-Access Removable Disk Pack Drive (256MB; incl one RM05-P disk pack; req VAX-11/780 MASSBUS adapter)	39,140	255	926
-BC(BD)	Dual-Access Removable Disk Pack Drive (256MB; freestanding; incl one RM05-P disk pack; req VAX-11/780 MASSBUS adapter)	39,140	255	926
RM80-AA(AD)	Single-Access Fixed Media Disk Drive (124MB; freestanding; req VAX-11/780 or VAX-11/750 MASSBUS adapter)	19,900	95	470
-BA(BD)	Dual-Access Fixed Media Disk Drive (124MB; freestanding; req VAX-11/780 or VAX-11/750 MASSBUS adapter)	22,000	110	725
RP06-AA(AB)	Single-Access Removable Disk Pack Drive (176MB; freestanding; incl one RP06-P disk pack; req VAX-11/780 or VAX-11/750 MASSBUS adapter)	34,000	190	904
-BA(BB)	Dual-Access Removable Disk Pack Drive (176MB; freestanding; incl one RP06-P disk pack; req VAX-11/780 or VAX-11/750 MASSBUS adapter)	39,140	210	1,242
	Dual-Access & Upgrade Options			
REM03-DA(DB)	RM03 Dual-Access Conversion Kit (contains RM03-C & VAX-11/780 MASSBUS adapter w/power supply to convert REM03-A to REM03-B)	11,700	45	966
REM05-CA(CB)	RM05 Dual-Access Conversion Kit (contains RM05-C & VAX-11/	14,700	85	1,751

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Model	Description	Purchase Price $	Monthly Maint $/Mo	Installation Charge $
	780 MASSBUS adapter w/power supply to convert REM05-A to REM05-B)			
REM80-DA(DB)	RM80 Dual-Access Conversion Kit (contains RM80-C & VAX-11/780 MASSBUS adapter w/power supply to convert REM80-A to REM80-B)	11,700	45	966
REP06-DA(DB)	RP06 Dual-Access Conversion Kit (contains RP06-C & VAX-11/780 MASSBUS adapter w/power supply to convert REP06-A to REP06-B)	14,700	50	1,608
RGM03-C	RM03 Dual-Access Conversion Kit (contains RM03-C & VAX-11/750 MASSBUS adapter to convert RGM03-A to RGM03-B)	11,700	45	966
RGM80-C	RM80 Dual-Access Conversion Kit (contains RM80-C & VAX-11/750 MASSBUS adapter to convert RGM80-A to RGM80-B)	11,700	45	966
RGP06-C	RP06 Dual-Access Conversion Kit (contains RP06-C & VAX-11/750 MASSBUS adapter to convert RGP06-A to RGP06-B)	14,700	50	1,608
RM03-C	RM03 Dual-Access Kit (contains drive logic & cables to convert RM03-A to RM03-B)	2,150	15	600
RM05-C	RM05 Dual-Access Kit (contains drive logic & cables to convert RM05-A to RM05-B)	5,150	15	671
RM80-C	RM80 Dual-Access Kit (contains drive logic & cables to convert RM80-A to RM80-B)	2,150	15	600
RP06-C	RP06 Dual-Access Kit (contains drive logic & cables to convert RP06-A to RP06-B)	5,150	20	1,242
RP06-U	RP05 to RP06 Upgrade Kit (incl drive upgrade parts & RP06-P disk pack)	10,500	NA	NA
	Disk Packs			
RM03-P	67MB Removable Disk Pack (for RM03)	635	NA	NA
RM05-P	256MB Removable Disk Pack (for RM05)	1,450	NA	NA
RP06-P	176MB Removable Disk Pack (for RP06)	875	NA	NA
	PERIPHERALS (UNIBUS OPTIONS)			
	Diskette			
RX211-BA(BD)	RX02 Diskette Subsystem (1MB; incl control. & two 0.5MB RX02 drives; req VAX-11/750)	4,150	45	413
	Cartridge Disks			
RL211-AK	Disk Drive and Control Unit (10.4MB; incl one RL02K-DC data cartridge; expandable to a total of four RL02 drives; req VAX-11/750)	6,900	68	397
RK711-EA(ED)	Single-Access Drive and Control Unit (28MB; freestanding; expandable to a total of eight RK06 or RK07 drives; incl RK07K-DC data cartridge; req VAX-11/780)	15,500	145	587
-FA(FD)	Dual-Access Drive and Two Control Units (28MB; freestanding; expandable to a total of eight RK06 or RK07 drives; incl one RK07K-DC data cartridge; req VAX-11/780)	23,500	190	683
	Add-On Cartridge Disk Drives			
RK07-EA(ED)	Single-Access Disk Drive (28MB; freestanding; incl one RK07K-DC data cartridge; req VAX-11/780 & RK711-E, RK711-F, or RK611 disk subsys)	11,200	115	524
-FA(FD)	Dual-Access Disk Drive (28MB; freestanding; incl one RK07K-DC data cartridge; req VAX-11/780 & RK711-E, RK711-F, or RK611 disk subsys)	15,000	130	559
-PA(PD)	Single-Access Disk Drive (28MB; freestanding; incl one RK07K-DC data cartridge; req VAX-11/750 & RK711 disk subsys)	11,200	115	524
RL02-AK	Disk Drive (10.4MB; incl one RL02K-DC data cartridge; req VAX-11/750 & RL211-AK subsys)	6,900	68	397
	Dual-Access Options			
RK711-C	Dual-Access Kit (contains drive logic & hardware, one control., & cables to convert an RK711-E to an RK711-F; req VAX-11/780 & RK711-E)	11,200	45	407
RK07-C	Dual-Access Kit (contains drive logic, hardware, & cables to convert an RK07-E to an RK07-F; req VAX-11/780 & RK07-E)	4,100	15	346
	Cartridge Disks and Accessories			
RK07K-EF	Error-Free Disk Cartridge (28MB; for RK07)	785	NC	NA
-AC	Alignment Cartridge (28MB; for RK07)	1,386	NC	NA
-DC	Disk Cartridge (28MB; for RK07)	430	NC	NA
RL02K-DC	Disk Cartridge (10.4MB; for RL02)	199	NA	NA

PRICE DATA

Model No.	Description	Purchase Price (Maint. not Incl) $	Monthly Maint. $
	BASIC SYSTEMS		
	Basic equip for all VAX-11/78 systems includes the VAX-11/780 CPU with virtual memory management, bootstrap loader, std set of 243 instructions, 8K parity bipolar cache memory, high-precision prgmbl real-time clock, time-of-year clock (with battery backup), & 12KB writable diagnostic control store. All systems offered in 2 versions: 115 VAC 60 cycle (LA version) and 230 VAC 50 cycle (LD version). Also included as std equip is an integral diagnostic console subsystem, for use in both local and remote operations, consisting of an intel microcomputer (LSI-11 with 16KB read/write memory; 8KB read-only memory) to which an RX01 floppy disk & the LA36 DECwriter II are connected.		
	Three versions of the VAX-11/780 are offered:		
	SV-AXKKA-LA/LD VAX-11/780 with 128KB of ECC MOS memory, an RK611 UNIBUS controller with 2 RK06 cartridge disk drives for a total of 28MB of on-line storage, 1 DZ11-A async multiplexor providing 8 EIA term. lines, & an LA36 DECwriter II console term.	128,600	588
	SV-AXTVA-LA/LD VAX-11/780 with 256KB of ECC MOS memory, an REM03 single access 67MB disk drive with MASSBUS adapter, a TEE16 mag tape transport unit with MASSBUS adapter, 1 DZ11-A async multiplexor providing 8 EIA term. lines, & an LA36 DECwriter II console term.	153,000	722
	SV-AXCVA-LA/LD VAX-11/780 with 512KB of ECC MOS memory, an REP06 single access 176MB disk drive with MASSBUS adapter, a TEE16 mag tape transport unit with MASSBUS adapter, 1 DZ11-A async multiplexor providing 8 EIA term. lines, & an LA36 DECwriter II console term.	185,000	832
	Processor Options		
FP780-AA/AB	High-performance floating-point accelerator for single- & double-precision floating-point instructions plus POLY, EMOD, & MULL; power supply incl	9,900	45
KU780	12KB writable control store (not supported by VAX-11 systems software)	10,000	50
	Expansion Memory		
MS780-AA/AB	128KB ECC MOS memory with controller; expandable to a total of 1MB with addn of 7 MS780-BAs or other combinations of expansion memories listed below	22,500	70
MS780-BA	128KB ECC MOS expansion memory	8,000	30
MS 780-BB	256KB ECC MOS expansion memory	13,000	60
MS780-BC	512KB ECC MOS expansion memory	22,000	120
H7112-A/B	MOS memory battery backup; powers 1MB of memory for at least 10 minutes or less memory for longer than 10 minutes	1,145	10
	MASS STORAGE		
	MASSBUS Peripherals		
	Moving-Head Disks		
REM03-AA/AD	Single-access 67MB removable disk pack drive & VAX-11/780 MASSBUS adapter; expandable to 8 drives	25,000	170
REM03-BA/BD	Dual-access(1) 67MB removable disk pack drive & 2 VAX-11/780 MASSBUS adapters; expandable to 8 drives.	33,000	215
RM03-AA/AD	Single-access 67MB removable disk pack drive	19,000	140
RM03-BA/BD	Dual-access(1) 67MB removable disk pack drive	21,000	155
REP05-AA/AB	Single-access 88MB removable disk pack drive & VAX-11/780 MASSBUS adapter; expandable to 8 drives	40,950	220
REP05-BA/BB	Dual-access(1) 88MB removable disk pack drive & 2 VAX-11/780 MASSBUS adapters; expandable to 8 drives	53,550	270
RP05-AA/AB	Single-access 88MB removable disk pack drive	31,400	190
RP05-BA/BB	Dual-access(1) 88MB removable disk pack drive	36,540	210
REP06-AA/AB	Single-access 176MB re-	44,000	220

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PRICE DATA (Contd)

Model No.	Description	Purchase Price (Maint. not Incl) $	Monthly Maint. $
	movable disk pack drive & VAX-11/780 MASSBUS adapter; expandable to 8 drives		
REP06-BA/BB	Dual-access(1) 176MB removable disk pack drive & 2 VAX-11/780 MASSBUS adapters; expandable to 8 drives	56,600	270
RP06-AA/AB	Single-access 176MB removable disk pack drive	34,000	190
RP06-BA/BB	Dual-access(1) 176MB removable disk pack drive	39,140	210
	Mag Tape Subsystems		
TEE16-AE/AJ	Program-selectable 800- or 1,600-bpi, 9-track, 45-ips mag tape transport & VAX-11/780 MASSBUS adapter; expandable to 8 TE16 transports	18,850	120
TE16-AE/AJ	Program-selectable 800- or 1,600-bpi, 9-track, 45-ips mag tape transport unit; industry compatible, prerequisite: TEE16 mag tape subsystem	11,290	60
	I/O UNIBUS Peripherals		
	Cartridge Disk Subsystems		
RK611-EA/ED	Single-access 14MB disk drive & control unit; expandable to 8 drives	17,000	106
RK611-FA/FD	Dual-access 14MB disk drive & control unit; expandable to 8 drives	26,400	148
RK06-EA/ED	Single-access 14MB disk drive	10,450	78
RK06-FA/FD	Dual-access 14MB disk drive	13,200	88
	Async Multiplexors		
DZ11-A	Async 8-line multiplexor for EIA/CCITT term. or lines; features prgmbl speeds up to 9,600 bps	2,310	25
DZ11-C	Async 8-line multiplexor for 20mA current loop term.; features prgmbl speeds up to 9,600 bps; expandable to 16 lines	2,310	25
DZ11-E	Async 16-line multiplexor for EIA/CCITT term. or lines; features prgmbl speeds up to 9,600 bps	3,740	46
	Single-Line Sync Interfaces		
DMC11-AL	Network link DDCMP microprocessor module (local); operates at 1M bps in full duplex; prerequisite: DMC11-MA or DMC11-MD	1,520	13
DMC11-DA	Network link remote line unit module	850	6
DMC11-FA	Network link remote line unit module	850	6
DMC11-AR	Network link DDCMP microprocessor module (remote)	1,520	13

(1) The dual-access capability of the disk subsystems is not yet supported by Digital operating system software or diagnostics.

Model No.	Description	Purchase Price (Maint. not Incl) $	Monthly Maint. $
DMC11-MA	Network link local line unit module; 1M bps; prerequisite: DMC11-AL	850	6
DMC11-MD	Network link local line unit module; 56K bps; prerequisite: DMC11-MD	850	6
	Line Printers		
LA11-PA/PD	Matrix printer (Digital's LA180 Line Printer); 180 cps, 132 col, 96 char	3,770	55
LP11-CA/CD	High-speed printer & control unit; 900 lpm, 132 col, 64 char	24,000	185
LP11-DA/DD	High-speed printer & control unit; 660 lpm, 132 col, 96 char	25,700	185
LP11-RA/RB	Heavy-duty line printer & control unit; 1,250 lpm, 132 col, 64 char	38,470	185
LP11-SA/SB	Heavy-duty line printer & control unit; 925 lpm, 132 col, 96 char	42,900	185
LP11-VA/VD	Printer & control unit; 300 lpm, 132 col, 64 char	11,800	95
LP11-WA/WD	Printer & control unit; 240 lpm, 132 col, 96 char	14,050	95
LP11-YA/YD	Printer & control unit; 600 lpm, 132 col, 64 char	22,000	108
LP11-ZA/ZD	Printer & control unit; 436 lpm, 132 col, 96 char	23,500	108
	Card Reader		
CR11/11-A	Card reader & control unit; 300 cards/min	6,170	53
	Terminals		
LA36-CE/CJ	DECwriter II hard-copy term. with numeric keypad; 30 cps, 96 char; 20mA current loop interface; prerequisite: DZ11-C or DZ11-F	2,100	19
VT52-AA/AB	A/N CRT term.; 96 char keyboard, 80-col-x-24-line display with cursor control	1,900	20
VT52-AE/AF	Same as above except with EIA/CCITT interface	1,900	20

		License Fee $
	SOFTWARE	
QE100-AY	VAX-11 FORTRAN IV-PLUS	3,300
QE101-AY	PDP-11 COBOL-74/VAX	7,700
QE102-AY	PDP-11 BASIC-PLUS-2/VAX	4,400
QE103-AY	VAX/RSX-11 Development Package	1,500

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Model	Description	One-Time License $
QE095-AY	VAX-11/780 VAX-11 BASIC (on diskette)	8,000
QD095-AG	VAX-11/780 VAX-11 BASIC (on TU58 tape cartridge)	8,000
QE110-AY	VAX-11/780 VAX-11 Pascal (on diskette)	5,000
QD110-AG	VAX-11/750 VAX-11 Pascal (on TU58 tape cartridge)	5,000
QE067-AY	VAX-11/780 VAX-11 CORAL 66 (on diskette)	10,000
QD067-AG	VAX-11/750 VAX-11 CORAL 66 (on TU58 tape cartridge)	10,000
QE114-AY	VAX-11/780 VAX-11 PL/1 (on diskette)	12,000
QD114-AG	VAX-11/750 VAX-11 PL/1 (on TU58 tape cartridge)	12,000
QE106-AY	VAX-11/780 BLISS-32 (on diskette)	13,800
QD106-AG	VAX-11/750 BLISS-32 (on TU58 tape cartridge)	13,800
QE102-AY	VAX-11/780 PDP-11 BASIC-PLUS-2/VAX (on diskette)	5,100
QD102-AG	VAX-11/750 PDP-11 BASIC-PLUS-2/VAX (on TU58 tape cartridge)	5,100
QE107-AY	VAX-11/780 FORTRAN IV/VAX-to-RSX Cross Compiler (on diskette)	1,000
QD107-AG	VAX-11/750 FORTRAN IV/VAX-to-RSX Cross Compiler (on TU58 tape cartridge)	1,000
	Communications	
QED01-AY	VAX-11/780 DECnet-VAX (on diskette)	3,100
QDD01-AG	VAX-11/750 DECnet-VAX (on TU58 tape cartridge)	3,100
QE111-AY	VAX-11/780 VAX-11 2780/3780 Protocol Emulator (on diskette)	5,100
QD111-AG	VAX-11/750 VAX-11 2780/3780 Protocol Emulator (on TU58 tape cartridge)	5,100
QE070-AY	VAX-11/780 MUX200/VAX (on diskette)	8,100
QD070-AG	VAX-11/750 MUX200/VAX (on TU58 tape cartridge)	8,100
	Data Management System	
QE105-AY	VAX-11/780 PDP-11 DATATRIEVE/VAX (on diskette)	4,500
QD105-AG	VAX-11/750 PDP-11 DATATRIEVE/VAX (on TU58 tape cartridge)	4,500
	Forms Management System	
QE701-AY	VAX-11/780 VAX-11 FMS (on diskette)	4,500
QD701-AG	VAX-11/750 VAX-11 FMS (on TU58 tape cartridge)	4,500
	Word Processing Utility	
QE707-YY	VAX-11/780 DX/VMS, WPS-8 to Host Software Utility (on diskette)	2,900
QD707-YG	VAX-11/750 DX/VMS, WPS-8 to Host Software Utility (on TU58 tape cartridge)	2,900
	Engineering Graphics Utilities	
QE051-YY	VAX-11/780 VAX-11 Pen Plotter Utilities (on diskette)	1,750
QD051-YG	VAX-11/750 VAX-11 Pen Plotter Utilities (on TU58 tape cartridge)	1,750
QE055-YY	VAX-11/780 VAX-11 Digitizer Utilities (on diskette)	1,750
QD055-YG	VAX-11/750 VAX-11 Digitizer Utilities (on TU58 tape cartridge)	1,750
QE053-YY	VAX-11/780 VAX-11 Engineering Drawing Utilities (on diskette)	1,750
QD053-YG	VAX-11/750 VAX-11 Engineering Drawing Utilities (on TU58 tape cartridge)	1,750

Notes:

CSQ	Customer service quote
NA	Not applicable
NC	No charge

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